TM 9-1868

WAR DEPARTMENT TECHNICAL MANUAL

TIRE REPAIR AND RETREAD

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WAR DEPARTMENT • 27 MAY 1943

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TIRE REPAIR AND RETREAD

WAR DEPARTMENT • *27 MAY 1943*

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WAR DEPARTMENT,
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TM 9-1868, Tire Repair and Retread is published for the information and guidance of all concerned.

[A.G. 300.7 (27 May 43)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

TECHNICAL MANUAL
ORDNANCE MAINTENANCE
TIRE REPAIR AND RETREAD

CHANGES
No. 1

WAR DEPARTMENT,
WASHINGTON 25, D. C., 13 November 1943

schedules be followed to get the maximum strength in the repair with the least effect on the original tire. Speed-up practices such as boosting mold temperatures and reducing time, or removing tires from molds when convenient, should be avoided. CURE ACCORDING TO SCHEDULES and maintain equipment so that it will attain the recommended temperature.

Precautions: Curing bag should be loosened with a minimum amount of tire spreading, then remove from a cold section of the tire.

Curing plug must be cold before finishing (buffing or grooving).

[A.G. 300.7 (3 Aug 43).] (C1, 13 Nov 43.)

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*The individual items in this change will be cut apart and pasted over the specific paragraphs or subparagraphs affected.

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CONTENTS

CHAPTER 1

OPERATION AND MAINTENANCE OF EQUIPMENT

1. GENERAL.

This section describes the operation and maintenance of the equipment provided for the retreading and repairing of pneumatic tires and tubes used by wheeled motor vehicles.

2. THE HOBART GENERATOR.

a. The Hobart Generator is powered by a GMC Model 270 Engine, the wiring diagram of which is shown in figure 1. It provides the necessary power for all the electrical equipment, of which the steam generator and buffer are highly important.

b. The engine controls are mounted on the instrument panel with the generator output voltage meter. All instructions and recommendations for engine starting, operating, and servicing for GMC vehicles with this model engine apply, except for the governor. Before the engine is stopped, it should idle for a few minutes. Service periods when recommended by mileage should be determined on the basis of 50 hr. to 1000 miles.

c. The engine is equipped with a Pierce centrifugal governor set for 1500 rpm at full load and 1800 rpm at no load. The governor

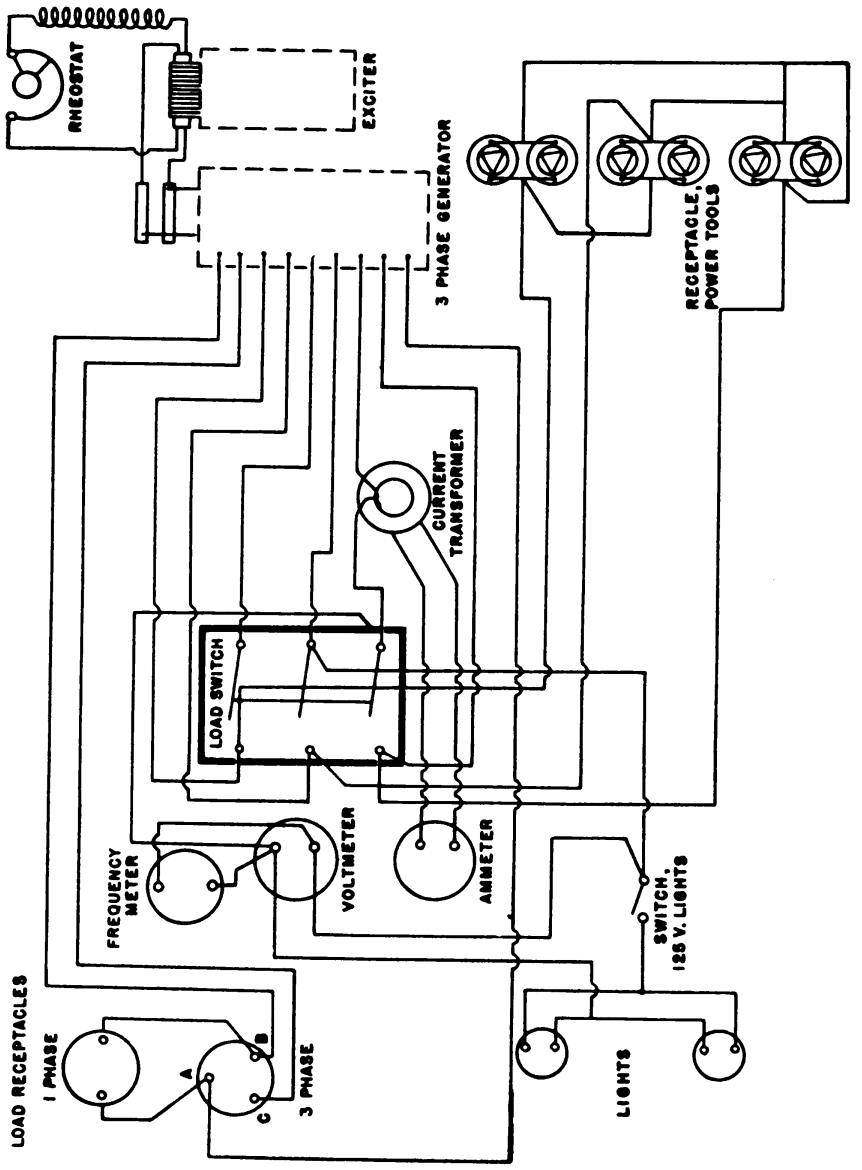


Figure 1 — Wiring Diagram, Hobart Generator

setting is to maintain the voltage output between 200 to 240 volts. Should it be necessary to readjust the governor to the quoted speeds, it may be done by turning the knurled nut, thereby increasing or decreasing the spring tension. Before making any adjustment, however, the engine should be checked for a slipping drive belt, or faulty mechanical condition, and the generator for load and voltage adjustment.

NOTE: The oil cups of the governor should be lubricated with crankcase grade oil every 12 hours of service.

3. THE STEAM GENERATOR.

a. The Kerrick Steam Generator, Model BO-10-HP, shown in figure 2, is manufactured by the Clayton Manufacturing Company. The burners will operate on diesel fuel, kerosene, or gasoline, in the order of preference. It is of the progressive flash design with a capacity of 346,000 Btu per hour at the normal operating pressure of 90 pounds steam accumulator-pressure. It is designed to perform automatically for intermittent or continuous operation of any load within its capacity. It is equipped with safety devices to protect against water failure, excessive high pressure, electrical low or high voltage, and excessive heating surface temperature. However, an attendant in charge must see that the water level is maintained and that the steam and fuel pressure gages remain within the limits prescribed in subparagraphs 3 and 4, below.

b. Installation of the steam generator is made in accordance with the following notes:

(1) Locate the generator on a solid base and shim as necessary to avoid distorting the frame when drawing down the mounting block.

(2) Use pipe unions adjacent to all connections to facilitate removal of parts.

(3) Connect feed water line from water supply intake valve (10), figure 2.

NOTE: Feed water pump (8) must have 24-in. minimum gravity head. This is provided by a booster pump feeding a tank which is provided with an open overflow return line.

(4) Connect fuel supply line to connection F, figure 2. If fuel storage tank is below fuel pump (23) use ½-in. ips pipe with a suitable check or foot valve installed at the storage tank. Foot valve must be ball type ¼-in. ips maximum. The maximum lift is 15-ft.

(5) Connect fuel return line to connection (R), figure 2. This must be an individual line back to the fuel storage tank.

CAUTION: This line delivers the surplus fuel back to the fuel storage tank, and must not be connected into the fuel supply line, as trapped air in the fuel system will cause ragged burner performance. Do not install a shut-off valve in this line. Check valve may be used. A closed return line will cause excessive pressure and result

in immediate damage to the fuel system.

(6) Connect the steam supply line to discharge valve (15). Do not reduce the steam header pipe size below the discharge valve size.

(7) Coil blow-down valve (18) and drain valve (13) may be connected into a common line of not less than ¾-in. ips and piped away from the unit.

(8) Strainer clean-out valves (11 and 12), figure 2, are to be piped away from unit using ½-in. ips minimum pipe size.

(9) Steam safety valve (4) should be piped away from the unit. Do not allow safety valve to blow off in a direction which may damage vital installations near it.

(10) Connect water return line from the steam trap at connection (T). Use ¾ in. ips minimum pipe size. Line should return to condensate return tank. This line will flow as much as 300 pounds of water per hour depending on plant operating conditions.

(11) Connect flue pipe to heater cover (34) at stack connection (S), and place stack covers over the stack.

(12) Make electrical line connection at (E).

c. To start and operate the plant proceed as follows:

CAUTION: Before starting the plant, check the fuel and water.

(1) Check all valves. Close strainer clean out valves (11 and 12), blow-down valve (18), drain valve (13), and pump drain valves (P). Open feed water valve (10), accumulator valve (17), trap valve (16), and coil inlet valve (14).

(2) Open water supply line from water storage tank to plant.

(3) Open fuel supply line from fuel supply tank to fuel pump (23).

(4) Turn the thermostat valve handle (27), left (counterclockwise) against stop pin. This will shut off fuel to the burner and allow it to circulate through the fuel pump and back to the storage tank when the electric motor (39) is started.

CAUTION: Never run the fuel pump without fuel circulation, as a dry pump will score and wear quickly.

(5) Start motor (39) at pushbutton switch located on side of electrical controls box (43).

(6) Bleed air from check valve housings through bleeder valves (33). If feed water pump (8) fails to prime, loosen intake check valves two turns (check valve wrench furnished), then re-tighten.

(7) Open burner inspection door (D). Check electrical ignition spark. Spark will be visible. Close burner inspection door.

(8) After pump has operated for approximately 5 minutes, water will appear in gage glass (2) on front of accumulator (1). Gage glass must show at least half-full before proceeding with next operation.

(9) Turn thermostat handle (27) right (clockwise). As handle is turned, the fuel pressure will rise on gage (22). At approximately

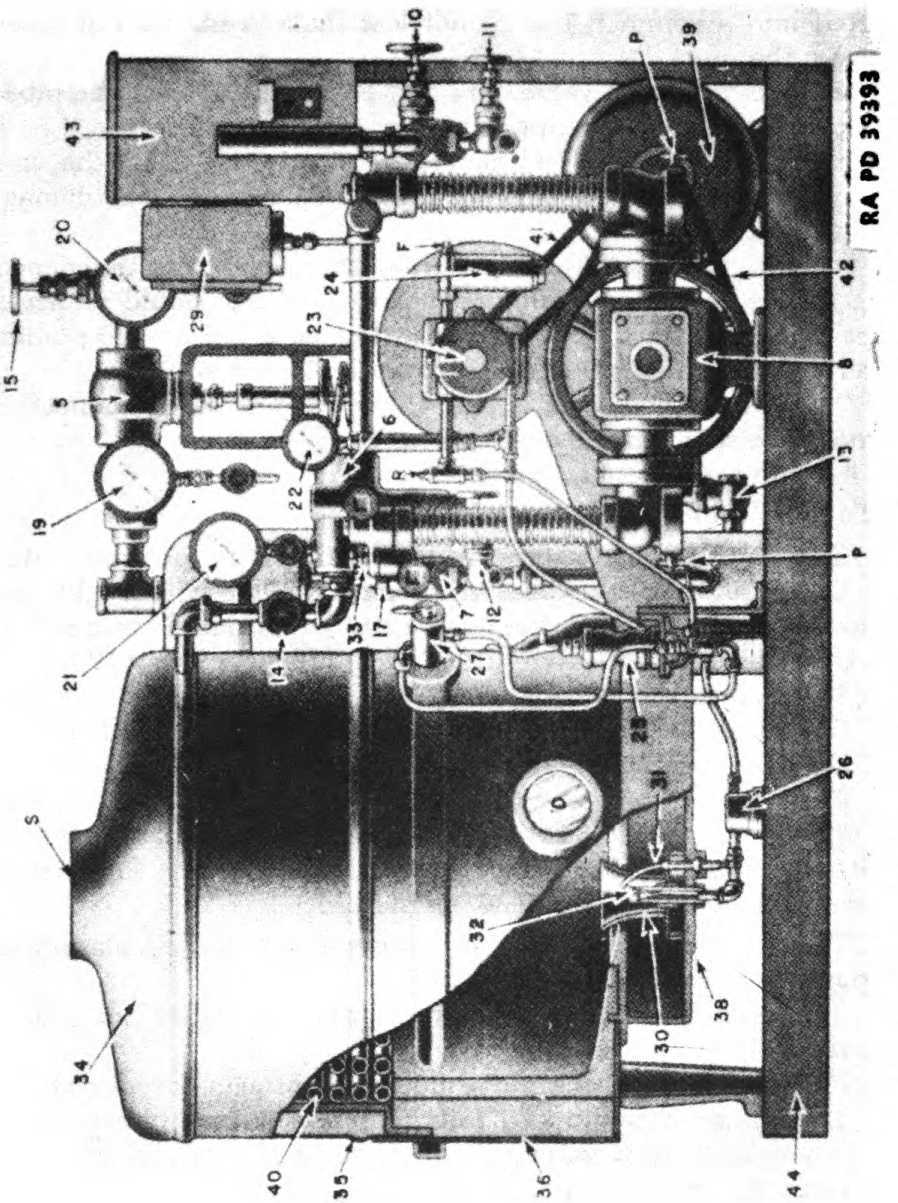


Figure 2 — The Kerrick Steam Generator — a. Front View

5—Steam pressure reducing valve
6—Mixing chamber
7—¾ in. "Y" strainer (2)
8—Feed water pump
10—Feed water intake valve
11—"Y" strainer drain
12—"Y" strainer drain
13—Coil blow down
14—Coil intake valve
15—Steam discharge valve
17—Accumulator to pump valve
19—Accumulator pressure gage
20—Steam pressure gage (reduced)
21—Back pressure gage
22—Fuel line pressure gage
23—Fuel pump
24—Fuel strainer
25—Steam regulating fuel valve
26—Fuel actuating valve
27—Thermostat valve
29—Pressure control switch
30—Burner manifold assembly
31—Ignition electrodes (2)
32—Burner tip
33—Check valve bleeder valves
34—Heater cover
35—Shell and insulation
36—Burner base assembly
38—Burner volute
39—Electric motor
40—Heating coil
41—Pump to blower belt
42—Pump to motor belts
43—Electrical controls bar
44—Boil base frame
D—Burner inspection door
F—Fuel intake connection
P—Pump head bleeder valves
R—Fuel return line connection
S—Flue connection

RA PD 39393A

Legend for Figure 2 a.

RA PD 39393A

85 pounds fuel pressure, burner will ignite. When handle (27) is turned RIGHT against the stop pin, the full fuel capacity is passed to the burner at approximately 140 pounds pressure.

(10) After burner is ignited, allow the plant to come up to pressure.

CAUTION: A constant water level of at least half-full in gage glass (2) should be maintained during this period. If water level drops, shut off burner by turning thermostat handle (27) LEFT, and allow the pump to operate until the water supply reaches the proper level. If unit fails to retain the proper level while burner is operating, shut down, check water supply, and re-bleed check valve housings (33).

(11) With plant operating, if the steam pressure rises too high, it may be regulated at thermostat handle (27). As handle is turned LEFT (counterclockwise) the fuel pressure will drop on gage (22). This may be lowered to approximately 70 pounds before the burner will shut down entirely. The fuel actuating valve (26) controls the fuel pressure delivered to the burner. There must be 85 pounds pressure in the fuel line to the burner before the actuating fuel valve will open, and it will close at 65 pounds pressure, thus eliminating any possible dripping at burner nozzle.

(12) When necessary, the volume of forced air to the burner may be regulated by adjusting the air intake regulator (A) on blower (37). This should be done when plant is operating at a constant full steam load. The best air regulation can be determined by closing the regulator (A) until the minimum gap between disk and blower with clear flue gases from the stack outlet is reached. After adjusting the intake regulator, tighten nut on jack screw to lock regulator in position.

d. The plant is automatic in operation. The following notes describe the functioning. Variation is an indication of trouble.

(1) The thermostat valve is set for maximum plant output and should require no manipulation. If it should be necessary to readjust it, the procedure in paragraph 17 below should be followed.

(2) The pressure control switch (29) is adjusted to cut out the motor, feed water pump, and burner at 90 pounds accumulator steam pressure as indicated on gage (19). It will cut in automatically and start the plant at 75 pounds steam pressure. If adjusting to maintain this range is ever necessary, refer to paragraph 17 below.

(3) The steam regulating fuel valve (25) will automatically lower the fuel pressure just before pressure switch (29) cuts out the plant at 90 pounds steam accumulator pressure. The range of the steam regulating fuel valve (25) must be correct to lower the fuel line pressure (22) to 90 pounds maximum before the burner actually cuts out. Stopping of the blower (37) (air to the burner) during the lag of fuel pressure will cause the burner to smolder during the automatic "OFF" periods, unless the steam regulating fuel valve (25) lowers

the fuel pressure and enables the actuating fuel valve (26) to make a clean, quick shut-off. To regulate the steam regulating fuel valve, consult paragraph 22, below, of this chapter.

CAUTION: Check the water level frequently in gage glass (2) for the first 24 hours of operation. The level should stand at least 4-in. minimum from the bottom of the gage glass at all times. If the water level drops, throttle the fire back by adjusting the thermostat valve handle (27) in a counterclockwise direction until the plant will maintain the proper water level. Do not operate with thermostat handle beyond this point until pump check valves or water supply can be corrected.

e. To shut down the plant the following procedure should be used:

(1) In normal weather:

(a) Turn thermostat valve handle (27) **LEFT** (counterclockwise) against stop pin to shut off burner.

(b) Turn off electric current at pushbutton station on side of electrical controls box.

(c) Close steam discharge valve (15).

(2) In freezing weather:

(a) While plant is operating at normal pressure, close feed water valve (10).

(b) Open coil blow-down valve (18).

(c) Open accumulator drain valve (13).

(d) Open strainer cleanout valves (11 and 12).

(e) Shut off burner. Turn thermostat valve handle (27) **LEFT.**

(f) Shut off electric current at pushbutton station on side of electrical controls box.

(g) Open pump drain valves (P).

4. THE 12-HOUR SERVICES.

The steam generator like any other piece of mechanical equipment, must receive normal attention and periodic check-ups if it is to continue performing the service it is designed to render. After each 12 hours of operation, the following service procedure must be carried out.

a. With plant operating, open valve (13) and allow steam accumulator (1) to blow freely for 15 seconds. Close valve (13).

b. Close accumulator to pump valve (17).

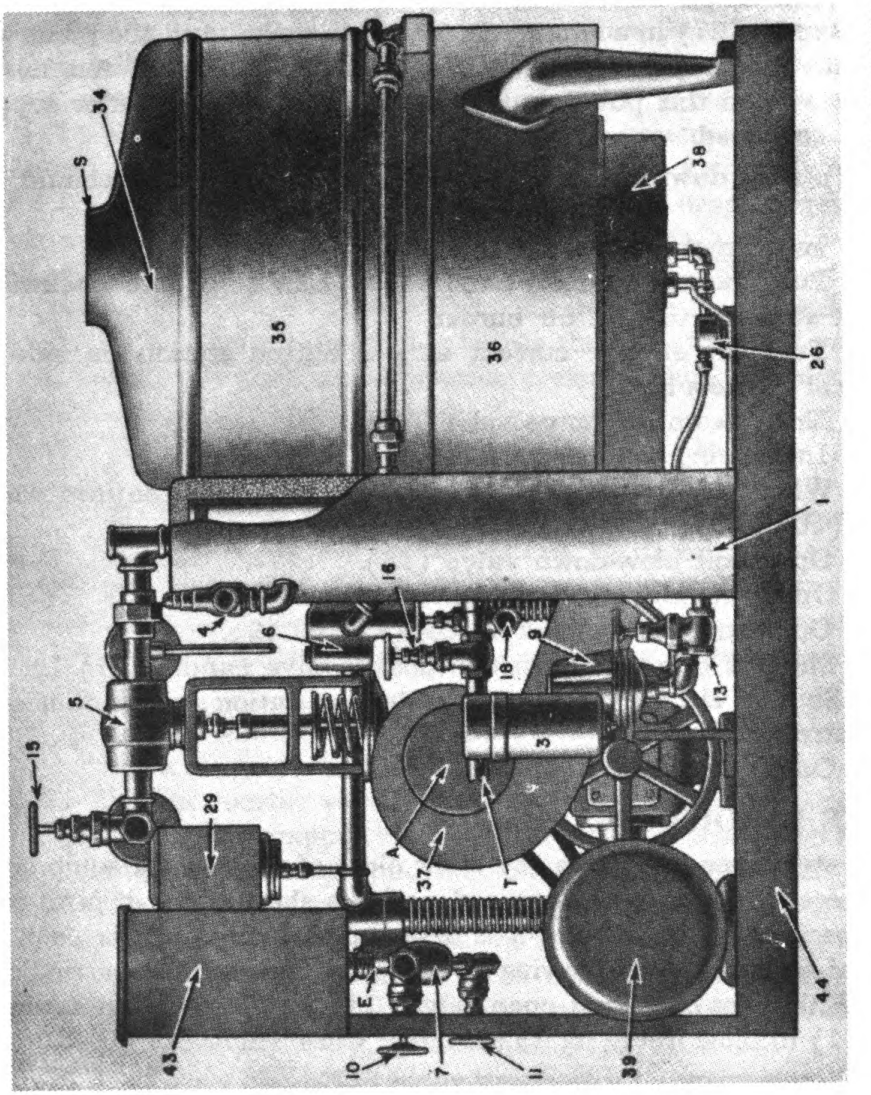
c. Drain pump columns through valves (P) until clear water appears. If they fail to drain freely, remove valve stems and use stiff wire to dislodge any sediment.

d. Drain pump snubber (9) through drain cock beneath snubber.

e. Blow down plant in the following sequence:

(1) Operating at full pressure, shut off water feed valve (10).

(2) Close accumulator to pump valve (17).



RA PD 39394

Figure 2 — The Kerrick Steam Generator — b. Rear View

1—Steam accumulator
3—Steam trap
4—Steam safety valve
5—Steam pressure reducing valve
6—Mixing chamber
7—¾ in. "Y" strainer (2)
9—Pump snubber
10—Feed water intake valve
11—"Y" strainer drain
13—Coil blow down
15—Steam discharge valve
16—Steam trap valve
18—Accumulator to drain valve
26—Fuel actuating valve
29—Pressure control switch
34—Heater cover
35—Shell and insulation
36—Burner base assembly
37—Burner blower assembly
38—Burner volute
39—Electric motor
43—Electrical controls bar
44—Boil base frame
A—Blower air intake regulator
E—Electrical line connection
S—Flue connection
T—Trap outlet connection

RA PD 39394A

Legend for Figure 2 b.

RA PD 39394A

(3) Close steam discharge valve (15).

(4) Open coil blow-down valve (13). This will allow coil to blow back until it is clear of water.

(5) Shut down burner, turn thermostat valve handle (27) left (counterclockwise).

(6) Close valve (18) and open valves (10), (15), (17) and allow plant to fill with water.

(7) When water appears in gage glass (2), start burner (turn thermostat valve handle RIGHT) and operate normally.

5. 100-HOUR SERVICES.

After every 100 hours of operation, the following service operations should be carried out:

a. Shut down the plant for complete inspection.

(1) When opening clean out valves (11 and 12), if strainers fail to flush clearly remove the screen by disconnecting drain valve and clamp, and then clean strainer thoroughly.

(2) Remove check valve disks from pump heads, located at (33), one at a time to avoid interchanging, and clean thoroughly. Lime, hard scale, and pits can be removed from the face of the disks by rubbing them on a piece of fine paper, flint (No. 0000), held firmly on a flat smooth surface.

CAUTION: It is best to remove spring while cleaning disk to avoid distortion.

(3) Apply the same procedure to check valve disk in the mixing chamber (6).

(4) Check pump and blower belts for tension. If belts are too loose, tighten by moving motor. Check belts for wear. Check pulleys for alinement.

(5) Check the blower rotor wheel in the burner blower (37). If blades are not clean, remove the regulator (A) and clean the fan wheel thoroughly. A dirty fan will cause poor burner performance.

b. Thoroughly dissolve 3 pounds of commercial tri-sodium phosphate (TSP) in a container with approximately 3 gallons of water. Add this solution to the water storage tank or hot well. Operate the plant normally for a 12-hour run. Then blow down thoroughly. (See "CARE OF THE PLANT — every 12 hours.")

c. Check all valves, lines, and connections for leaks.

d. Check the back pressure on gage (21) frequently. This pressure will normally run approximately 40 pounds above the steam accumulator pressure (19). To check this pressure carefully, open the globe valve below gage (21) just enough to register a steady pressure on gage. If pressure runs above normal, it may be necessary to blow down the plant more often due to hard water conditions.

6. THE WATER CIRCUIT.

a. With the plant in operation, the feed water and condensate are drawn from the water supply tank or hot well and pumped into the heating coil (40) by one stage of the feed water pump (8). This progressive, counterflow heating coil keeps the water constantly moving and agitated to rapidly change the temperature of the particles in contact with the outer walls, thus preventing localized overheating and formation of steam pockets. From the lower heating stages of the coil, the water passes into the counterflow thermostat tube (28), equalizing the temperature throughout the entire length of the tube, causing direct expansion and contraction of the tube to accurately control the pressure of the steam by regulating the amount of the fuel passed to the burner through the fuel valve. The water is then delivered from the thermostat tube (28) to the accumulator (1) which serves a three-fold purpose: that of a flash dome; a re-circulating water chamber; and a sediment trap. Being out of the heat zone, solids settling in it do not harden to form scale. Only a part of the hot water expanded into the accumulator is flashed into steam; the balance in fluid form collects in the lower half of the accumulator. The bottom of the accumulator provides for the collection of precipitated solids, which may be blown out at cleaning intervals through valve (13).

b. The unvaporized water is re-circulated by the other stage of the feed water pump (8) and blended with the pumped hot well water in a common mixing chamber located in the feed line to the coil.

c. When steam is not being used, the pressure rises to operate a pressure control which shuts off the pump, motor, and burner until a slight drop in pressure, due to steam use of condensing, automatically puts the generator back into full operation. Any desired pressure or temperature within the range of the plant may be accurately and automatically maintained by a simple adjustment of the regulating controls.

7. STRUCTURAL PARTS.

The steam generator consists of the following main structural parts, figure 2: burner volute (containing burner manifold assembly) (38), burner base and insulation assembly (combustion chamber) (36), heating coil assembly (40), shell and insulation assembly (35), and heater cover (34).

a. To remove the coil from the unit:

(1) Disconnect the smoke stack from the heater cover (34).

(2) Break the two pipe connections into the coil. (The thermostat tube (28) does not remove with the coil.)

(3) Remove the cap screws and lift off heater cover (34).

(4) Unscrew the cap screws holding the shell and insulation as-

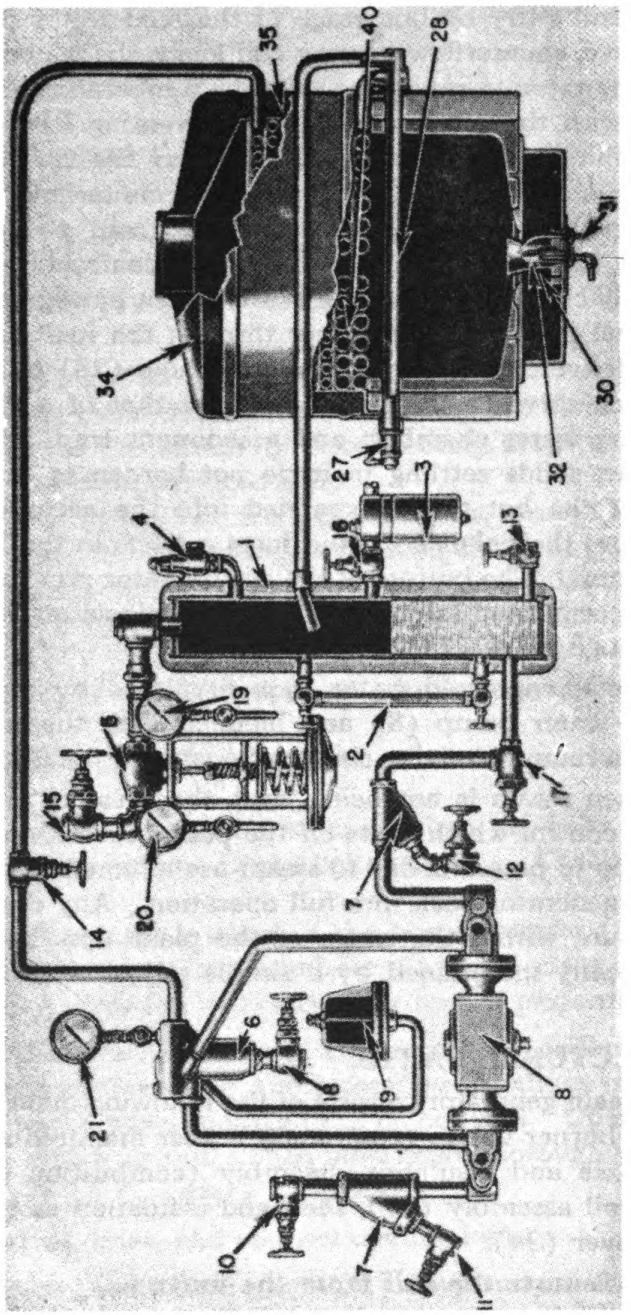


Figure 3 — The Water Flow Diagram

1—Steam accumulator assembly
2—Water gage glass assembly
3—Steam trap
4—Steam safety valve
5—Steam pressure reducing valve
6—Mixing chamber
7—¾-in. "Y" strainer (2)
8—Feed water pump
9—Pump snubber
10—Feed water intake valve (¾-in. gate valve)
11—Intake "Y" strainer drain valve (½-in. globe valve)
12—Recirculating strainer drain valve (½-in. globe valve)
13—Accumulator drain valve (½-in. globe valve)
14—Coil intake valve (½-in. gate valve)
15—Steam discharge valve (1-in. gate valve)
16—Steam trap valve (½-in. gate valve)
17—Accumulator to pump valve (¾-in. angle valve)
18—Mixing chamber drain or coil blowdown valve (½-in. globe valve)
19—Accumulator pressure gage
20—Steam pressure gage (reduced)
21—Back pressure gage
27—Thermostat valve
28—Thermostat tube assembly
30—Burner manifold assembly
31—Ignition electrodes (2)
32—Burner nozzle
34—Heater cover
35—Shell and insulation assembly
40—Heating coil assembly

RA PD 39395A

Legend for Figure 3

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sembly (35) to the burner base (36).

(5) Unscrew the four cap screws which hold the coil (40) to the burner base.

(6) Lift the shell assembly (35) straight up over the coil and remove the coil or if restricted for space lift both the shell assembly and coil off together and remove the shell from the coil afterward.

The thermostat tube can be removed without removing the coil assembly. To replace the thermostat tube, first remove the thermostat valve (27). Turn thermostat tube left (counterclockwise) until it is free, and slide it out through the thermostat valve mounting bracket. Install new thermostat tube and replace the thermostat valve as explained under "INSTRUCTIONS FOR INSTALLING THERMOSTAT VALVE" paragraph 17 d below.

b. To remove the burner volute assembly:

(1) Break the fuel line connections to the burner manifold (30).

(2) Disconnect the ignition cables from the ignition electrodes (31).

(3) Remove the 3 hex nuts holding the volute to the burner base bottom. Drop the volute down and slide it out of the air duct and remove between the burner base legs.

8. FUEL FLOW.

a. The fuel flow diagram is shown in figure 4. Fuel enters the fuel pump, paragraph 18, from the fuel supply tank through the fuel strainer, paragraph 19. The fuel pump, being capable of a fuel capacity in excess of the actual needs of the plant, continually by-passes surplus fuel back to the fuel supply tank. The flow is then through the actuating fuel valve, paragraph 15, to the steam regulating fuel valve, paragraph 16, and the thermostat valve, paragraph 17.

b. The actuating fuel valve opens the fuel supply to the burner at 85 pounds fuel line pressure. Fuel line pressure immediately builds up to approximately 140 pounds pressure, which is constantly maintained during normal plant operation. The full 140 pounds fuel line pressure is maintained against both the steam regulating fuel valve and the thermostat valve, but they by-pass no fuel under normal conditions.

c. The steam regulating fuel valve begins to by-pass fuel when the steam pressure in the accumulator rises to 87 pounds (approximately 3 pounds below automatic plant shut-down pressure), thereby lowering the fuel line pressure to approximately 90 pounds. This action throttles the fire somewhat, but does not prevent the plant from building up to the 75 pound steam pressure at which point the pressure control switch, paragraph 22, automatically breaks the electric circuit to the motor, which stops the entire system. When the fuel pump stops, the fuel line pressure drops to 0. The actuating fuel

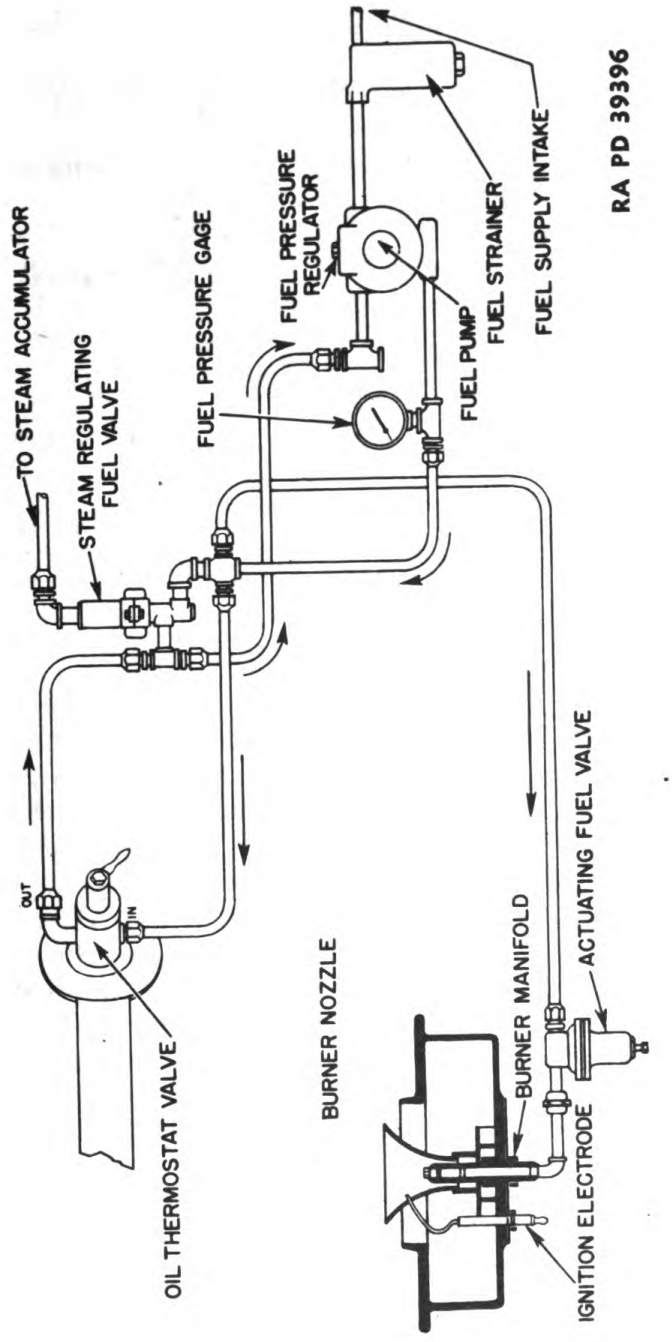


Figure 4 — Fuel Flow Diagram

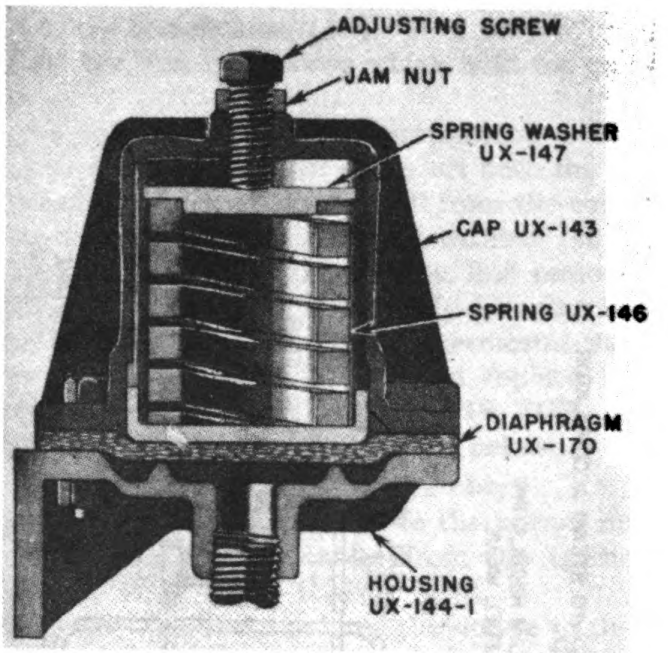


Figure 5 — Pump Snubber

valve shuts off the fire completely as soon as the fuel line pressure drops below 65 pounds. The action of the steam regulating fuel valve, in reducing the fuel line pressure to more nearly approach the actuating fuel valve shut-off of 65 pounds before the fuel pump stops enables the actuating fuel valve to make a cleaner, quicker shut-off, thereby eliminating fuel drip and smoldering at the burner.

d. The thermostat valve does not by-pass any fuel back to the fuel supply tank, unless it is manually regulated for a low fire or the heating surface temperature in the generator rises excessively high due to water failure or low water conditions. Should this condition exist, the thermostat valve automatically by-passes fuel, thereby lowering the fuel line pressure and throttling the fire down to a point where the coil will not be damaged by overheating. If the thermostat valve by-passes enough fuel, the pressure will drop below 65 pounds at which point the actuating fuel valve will shut down the fire completely.

9. THE PUMP SNUBBER.

The pump snubber, figure 5, is installed to reduce pump pulsation in the water circulation system. Normal pulsation is approximately 30 pounds on the back pressure gage.

a. The snubber should be drained periodically by means of the bleeder valve located underneath the snubber. This will eliminate any accumulation of sludge and scale under the diaphragm which would cause improper operation of the snubber.

b. To adjust the snubber, unscrew the adjusting screw located at the top of the snubber until it is relieved of all tension. With the plant operating normally under an accumulator gage pressure of 90 pounds, gradually screw the adjusting screw in, increasing the tension on the snubber spring until back pressure gage shows a minimum pulsation. Secure the adjusting screw with the locknut.

10. THE FEED WATER PUMP.

The feed water pump, figure 6, delivers and circulates water through the entire plant.

a. This pump is a combination feed water and recirculating pump. The left check valve housing (10) furnishes the additional incoming water to the system while the right check valve housing (9) recirculates any excess water in the system which is not flashed into steam. It is belt driven at approximately 330 rpm. It employs 2 diaphragms (23) with a stroke of 0.150 in. to furnish positive displacement, pumping a capacity of 300 pounds of water per hour under normal plant operating conditions.

b. The crankshaft bearings (26 and 27) and the wrist pin bearings (12) operate in SAE 10 engine oil. The oil level is indicated by the sight gage (25) on the front of the pump. Failure to maintain the oil level at or above the line ⅛ in. from the top of the sight gage will result in early pump failure.

c. The check valve housings (9 and 10) require no manual adjustment other than loosening bleeder valves (49) to release trapped air from check valve housings on starting pump.

d. The bleeder valves (28) should be opened periodically to drain off any accumulation of sludge in the pump heads.

e. Care of the pump. Every 100 hours of service the check valve housings should be inspected for dirt or lime scale on the check valve disks (45). Remove disks one at a time to avoid interchanging. Lime, hard scale, or pits can be removed from the disks by rubbing them on a piece of fine flint paper (No. 0000), held firmly on a flat smooth surface.

CAUTION: Do not distort valve spring when cleaning disk. It is best to remove spring from disk before cleaning, and reassemble afterwards. Be sure that the proper oil level is maintained at all times.

f. To dismantle pump:

(1) Remove ¼ in. pipe plug (31) on the front of the crankcase and drain out the lubricating oil. Disconnect all pipe connections to the check valve housings (9 and 10). Remove the cap screws and studs (35) and (36) which hold the pump heads (7) in place. Remove pump heads (7), stand pipes (8) and check valve housings (9 and 10) as an assembly.

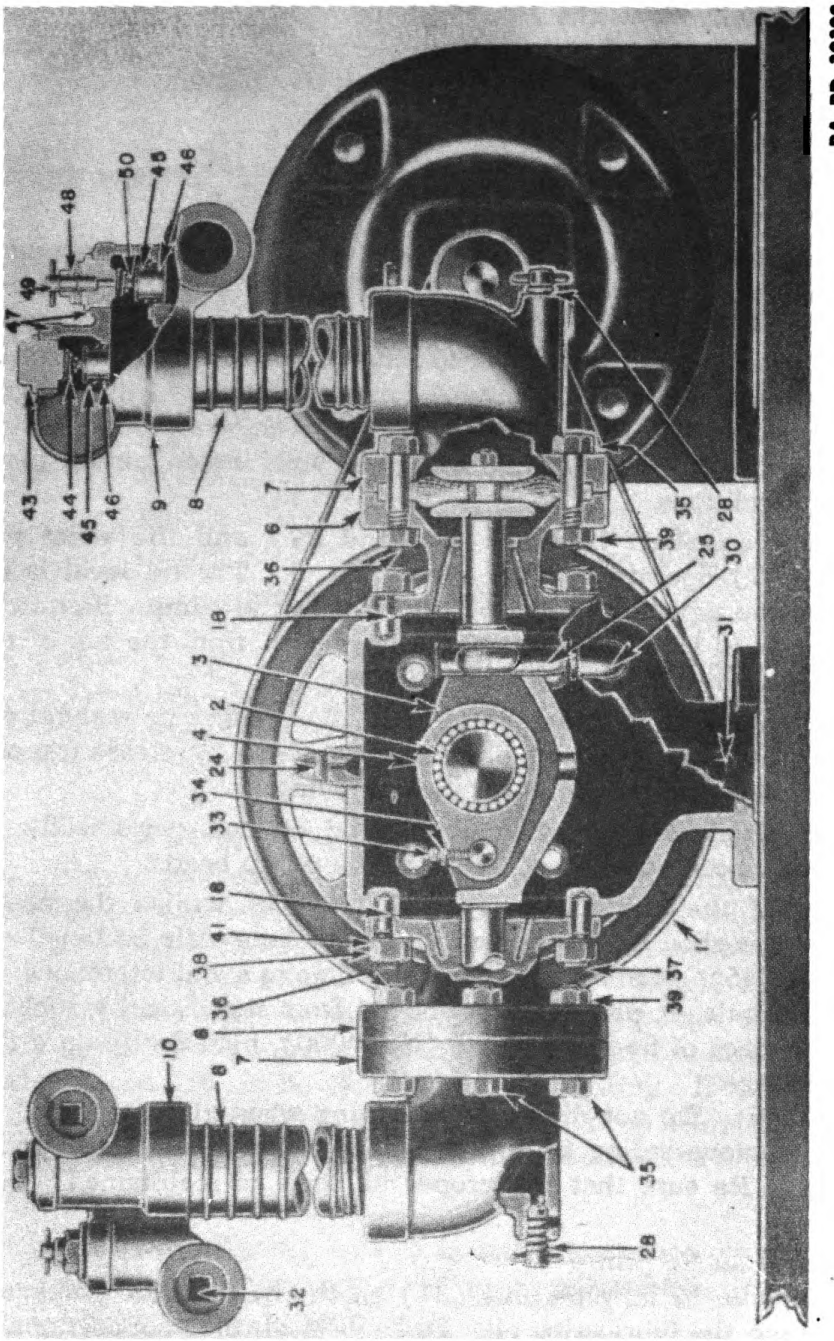
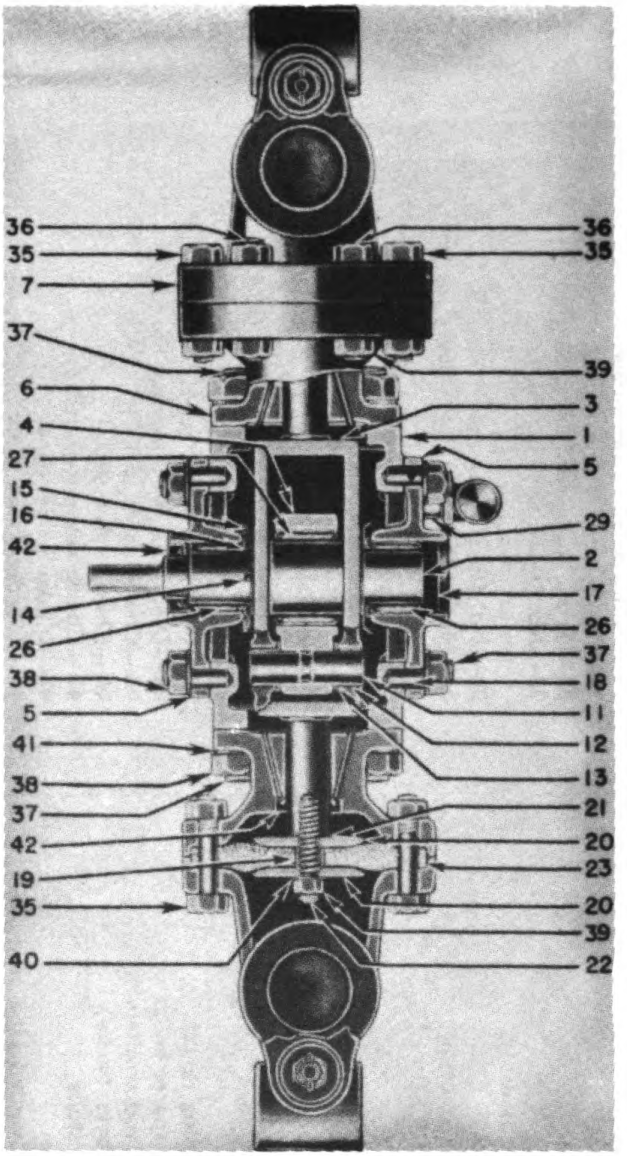


Figure 6 — Feed Water Pump — a. Front View

1—Crankcase
2—Crankshaft
3—Yoke
4—Connecting link
5—Bearing flanges
6—Base flanges
7—Pump heads
8—Stand pipes
9—Check valve housing assembly (R)
10—Check valve housing assembly (L)
11—Wrist pin
12—Wrist pin bearings
13—Spacer washers (conn. link)
14—Oil slinger pins
15—Oil slingers
16—Thrust washers
17—Seal cap
18—Flange aligning dowels
19—Diaphragm spacer collar
20—Connecting rod washers
21—Spacer washers (yoke)
22—Diaphragm studs
23—Diaphragms
24—½ in. brass vented pipe plug
25—Gits oil sight gage
26—No. B-1816-X Torr. Needle bearing
27—No. B-2420-X Torr. Needle bearing
28—Bleeder valve assembly
29—¼ in. x short pipe nipple
30—¼ in. x 90° pipe elbow
31—¼ in. standard pipe plug
32—¾ in. standard flush pipe plug
33—No. 10–32 x ¾ in. fill. hd. mach. sc.
34—No. 10–32 hex. nut
35—⅜ in. 16 x 2 in. hex. head cap screw
36—⅜ in. 16 x 2½ in. studs
37—½ in. 13 x 1½ in. studs
38—½ in. 13 hex. nuts
39—⅜ in. 16 hex. nuts
40—⅜ in. lock washers
41—½ in. lock washers
42—No. 213 Garlock Klozare seals
43—Discharge valve caps
44—Discharge valve springs
45—Check valve disks
46—Check valve seats
47—Check valve cap gaskets
48—Intake valve caps
49—Bleeder valve stem
50—Intake valve springs

RA PD 39398A

Legend for Figure 6



RA PD 39399

Figure 6 — Feed Water Pump — b. Top View

(See page 21 for key to numbers)

(2) When the ⅜ in. hex. nuts (39) are removed, the connecting rod washers (20), spacer collar (19), diaphragm (23) and spacers (21) may be slipped off over the studs (22). It is unnecessary to remove the studs (22).

(3) Unscrew the ½ in. hex. nuts (38) which hold the bearing flanges (5) in place. Slip the bearing flanges off over the studs (37) and the crankshaft (2). The bearings will remain in place in the flanges.

CAUTION: These bearing flanges (5) are line reamed and *must not be reversed.* Note center-punch marks on the flanges.

(4) Remove thrust washer (16), oil slinger pin (14), and oil slinger (15) from one end of the crankshaft (2). Slide crankshaft out of pump from the opposite side of the pump.

(5) Unscrew the hex nuts (38) which hold the pump head flanges (6) in place and slide them off over the studs (37). The yoke (3) and connecting link (4) then come out as an assembly.

CAUTION: Pump head flanges are line reamed and must not be interchanged. Note center-punch marks on flanges.

g. To reassemble pump:

(1) If it is necessary to press new needle bearings in place either in the bearing flanges (5) or the connecting link (4) pressure must be applied only to the stamped end of the needle bearing.

(2) Make up the yoke (3), connecting link (4), needle bearing (27), wrist pin (11), wrist pin bearings (12), and spacer washers (13) as an assembly and place them inside the crankcase (1).

(3) Bolt the pump head flanges (6) in place. It may be necessary to tap them lightly to pass the yoke (3) through the closure seals (42).

CAUTION: Be sure that pump head flanges are reassembled with the drain hole down and that they are on the same side of the crankcase as they were before removal.

(4) Assemble the crankshaft with one of the bearing flanges (5), bearing (26), closure seal (42), thrust washer (16), oil slinger (15), and oil slinger pin (14) on the pulley end of the crankshaft.

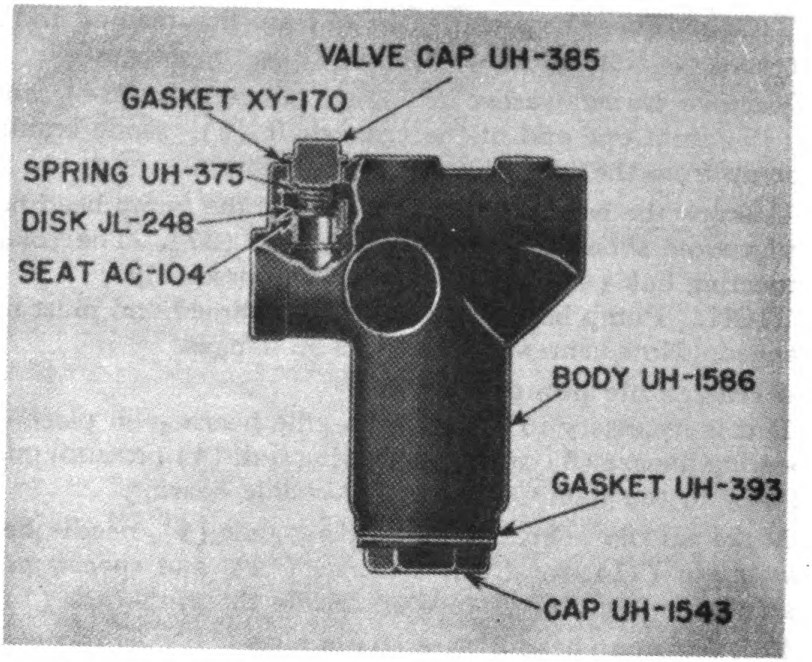
CAUTION: Be sure that this bearing flange has not been interchanged and that it is the one which was originally on this side of the crankcase; note center-punch marks; feed the crankshaft through the yoke and connecting link bearing until the bearing flange is in place; and replace bearing flange nuts and tighten in place.

(5) Assemble the oil slinger (15), oil slinger pin (14), and thrust washer (16) on the other end of the shaft and replace the bearing flange on that end. Press seal cap (17) in place.

(6) Replace the diaphragm (23) as shown in the illustration. Rubber cement should be used between the connecting rod washers (20) and the diaphragms (23) to insure a leakproof seal. When tightening the diaphragms in place on the diaphragms stud (22) be sure a metal to metal contact is made. This is absolutely essential.

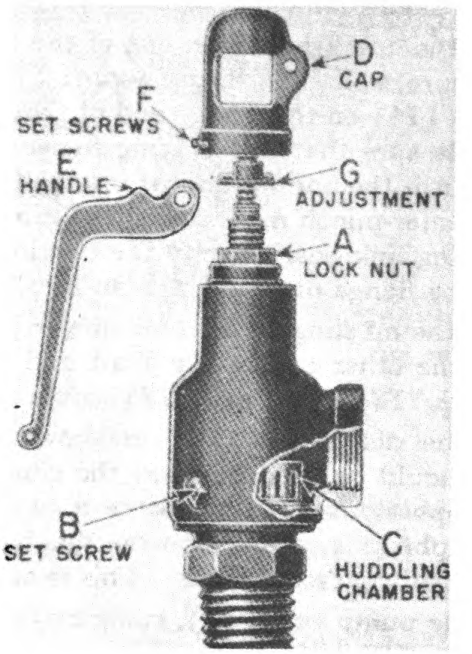
(7) Replace the pump heads (7), being certain to obtain a metal to metal contact to all points. If this contact is not made it will cause fatigue and early breakage of the cap screws (35) and studs (36).

(8) Fill crankcase with oil to the proper level and the pump is now ready for operation.



RA PD 39400

Figure 7 — The Mixing Chamber



RA PD 39401

Figure 8 — Consolidated Steam Safety Valve

(9) Permatex, Formagasket, or a gasket paper not in excess of .005 in. thick may be used between flanges and crankcase to insure an absolutely tight oil seal.

11. THE MIXING CHAMBER.

The mixing chamber, figure 7, is located in the feed line to the coil. Fresh incoming water and recirculated water from the accumulator combine at this point and are pumped into the heating coil. The combining of hot and cold water at this point causes a precipitation of solids in the mixing chamber which must be periodically blown out through the valve at the bottom of the mixing chamber. Opening this valve causes the oil to blow back in the opposite direction to its normal flow.

a. The built-in check valve in the mixing chamber protects the feed water pump diaphragms against excessive back pressure. This check valve is very similar to the check valve in the feed water pump check valve housings and must receive the same care as explained in paragraph 10 e, "Care of the pump".

12. THE CONSOLIDATED STEAM SAFETY VALVE.

The consolidated steam safety valve, figure 8, is installed on the steam accumulator to relieve excessive steam pressure and assure safe performance. This valve is adjusted and sealed to relieve at 125 pounds steam accumulator pressure.

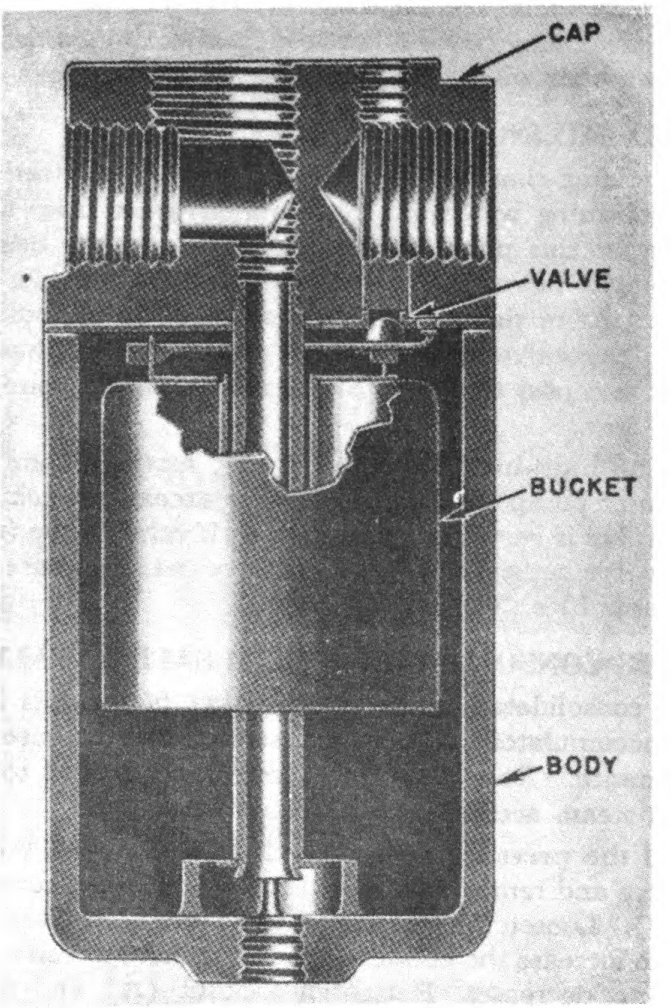
a. If the pressure setting needs to be changed, break the seals on the valve and remove the handle (E), loosen set screws (F), remove cap (D). Loosen the locknut (A) and screw the stem RIGHT (clockwise) to increase the pressure point at which the valve will relieve, and LEFT to decrease. Retighten locknut (A) and replace cap and handle. The adjustment (G) regulates distance at which the handle (E) rests from the body of the valve.

b. The differential (amount of steam blown off after the pressure reaches the blow-off point) is adjusted by loosening set screw (B) and by reaching through the discharge opening in the valve, and turning the huddling chamber (C) RIGHT to increase and LEFT to decrease the differential. Tighten set screw (B) and seal.

13. THE STEAM TRAP.

The purpose of the steam trap, figure 9, is to serve as a balancer in the water circulation system by regulating the water level in the accumulator.

a. If the water in the gage glass on the accumulator rises too high, it may be due to improper operation of the steam trap. Sludge or scale in the trap may cause the vent in the top of the bucket assembly to become clogged or prevent the valve from seating prop-



RA PD 39402

Figure 9 — Steam Trap

erly. Scale will sometimes form inside the valve seat, restricting the outlet. The steam trap can be easily inspected by removing the cover.

b. Scale may sometimes be removed from the seat by tapping the cover lightly. A trap suspected of operating improperly may be checked by removing the plug in the cover. Steam should escape in intermittent spurts. A steady escape requires that the line be shut off and the cover removed for cleaning. Steam traps installed after each mold are similar in construction and operation, and require the same attention.

c. Strainers are installed before each trap to collect scale and dirt. Strainers should be opened and cleaned about once a month.

TIRE REPAIR AND RETREAD

14. CLAYTON STEAM PRESSURE REGULATING VALVE.

The plant is equipped with the Clayton steam pressure regulating valve, figure 10, which reduces the steam pressure in the steam discharge line.

a. The valve is adjusted to maintain a constant discharge pressure in the steam discharge line. The pressure should be as high as possible in order to insure adequate pressure at the regulator in the system. Should the steam demand on the unit suddenly be increased to any great extent, the discharge gage pressure will drop during the period required for the system to balance itself with the sudden change in operating load.

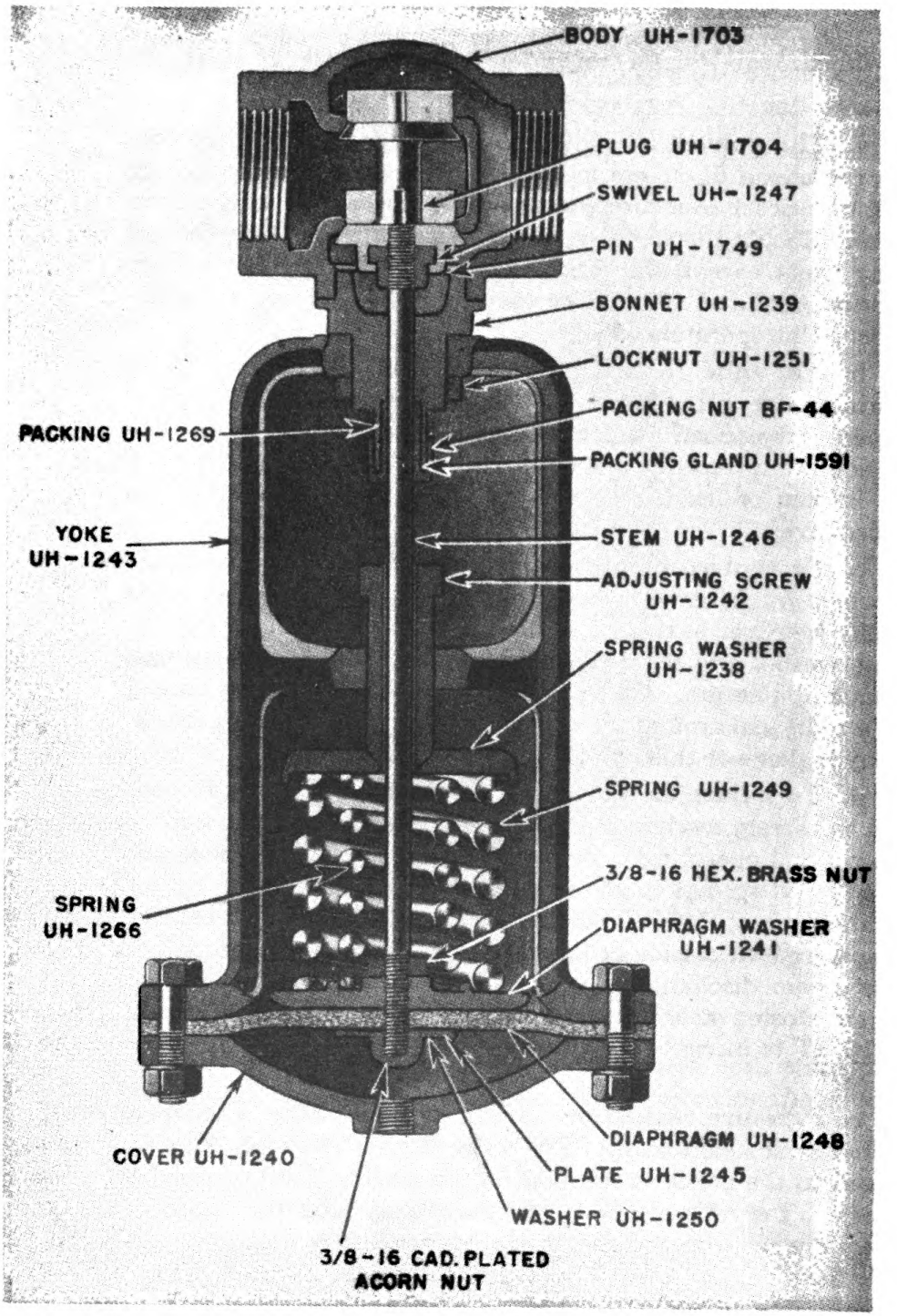
b. The tube from the discharge side of the steam pressure regulating valve to the bottom of the valve's diaphragm chamber must be open and unobstructed for the proper operation of the valve. Too much compression on the packing will cause binding on the stem. A broken or leaking diaphragm will cause the valve to become inoperative.

c. To replace diaphragm: Relieve all compression on the springs by unscrewing adjusting screw. Remove cap screws which hold the cover to the yoke. Remove cover. Remove the ⅜ in. acorn nut, washer and plate from stem underneath the diaphragm, and remove diaphragm. When replacing the diaphragm, be sure that there is a tight seal around the stem where it passes through the diaphragm. Any leakage at this point will cause faulty operation of valve.

d. To adjust the valve: For initial adjustment, close the valve on the steam discharge line. Start the plant and allow it to build up to normal operating pressure of 90 pounds on the accumulator gage. Compress springs in steam pressure regulating valve by turning adjusting screw RIGHT (clockwise) until 60 pounds steam pressure is registered on discharge line gage. Release steam pressure by opening steam discharge valve and re-check reduced steam pressure by again closing steam discharge valve. Adjusting screw may be turned RIGHT to increase the discharge pressure, or LEFT to decrease pressure.

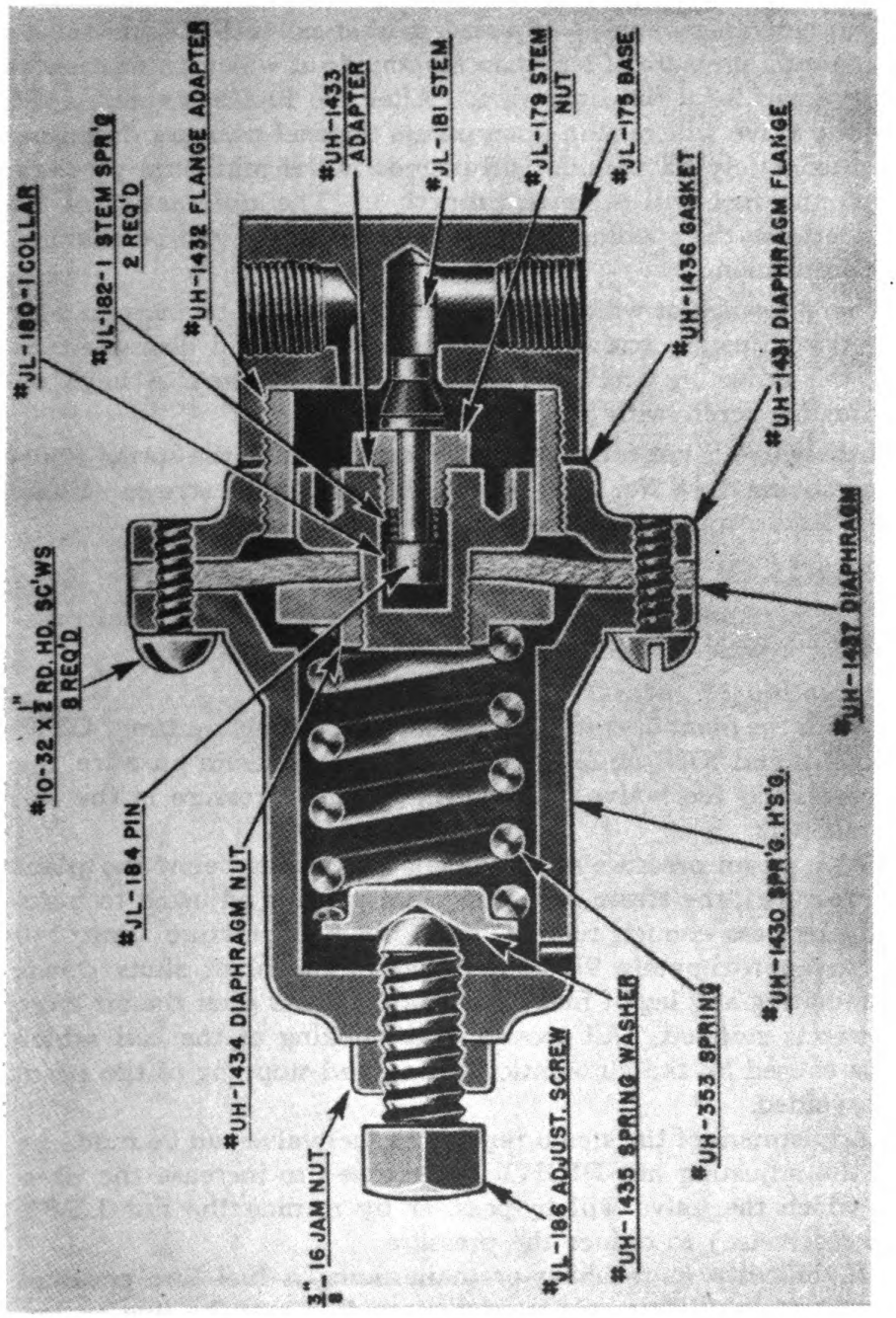
e. Pressure regulators are cut into the piping in each trailer supplied with steam or air. The steam line to the section molds is regulated to the pressure specified in the curing chart for repairing. The lines to the retread molds and the supply lines for the section repair bags are regulated to the pressure specified for treading. All air supply lines are similarly regulated to the requirements of the equipment on the line.

Adjustment is made by turning the adjusting nut until the gage in the trailer reads the desired pressure. Make all adjustments a part of a turn at a time and check each setting by bleeding off enough steam or air to allow the regulator to function.



RA PD 39403

Figure 10 — Clayton Steam Pressure Regulating Valve



RA PD 39404

Figure 11 — Actuating Fuel Valve

ORDNANCE MAINTENANCE

15. THE ACTUATING FUEL VALVE.

The actuating fuel valve, figure 11, is installed in the fuel line to prevent any oil drip at the oil burner nozzle in the combustion chamber.

a. The actuating valve is adjusted so that no fuel is admitted to the burner at a pressure of less than 85 pounds at which point it automatically provides a full open flow. After the fuel has entered the burner, the valve will remain open unless the fuel pressure drops below approximately 65 pounds (65 pounds is the minimum pressure at which the fuel will atomize properly). The differential of 20 pounds between the opening and closing pressures cannot be changed by any adjustment.

b. The pressure at which the valve will open can be increased by turning the adjusting screw **RIGHT** (clockwise) and decreased by turning the adjusting screw **LEFT** (counterclockwise). Always secure adjusting screw with jam nut after adjusting.

c. If the valve is not functioning properly, remove the spring housing by removing the 8 No. 10 — 32 x ½ in. round head screws. Flush the valve and inspect the diaphragm for breakage.

16. THE STEAM REGULATING FUEL VALVE.

The steam regulating fuel valve, figure 12, serves as a fuel pressure regulator which is operated by the steam pressure.

a. Operation of the valve:

(1) With the plant operating on automatic controls shutting "OFF" at 90 pounds and "ON" at 75 pounds accumulator steam pressure, the steam regulating fuel valve will control the fuel pressure in the following manner:

(2) At a steam pressure of 87 pounds (3 pounds below the plant cutout pressure), the steam regulating fuel valve is adjusted to automatically by-pass enough fuel to lower the fuel pressure from 140 pounds to approximately 90 pounds before the plant shuts down, thus eliminating any lag of fuel spray in the burner after the air from the blower is stopped. All sooting and smoking of the coil which might be caused by the automatic starting and stopping of the plant will be avoided.

(3) Adjustment of the steam regulating fuel valve can be made by turning the adjusting nut **RIGHT** (clockwise) to increase the pressure at which the valve will by-pass, or by turning the nut **LEFT** (counterclockwise) to reduce the pressure.

(4) If difficulty in reaching or maintaining a fuel line pressure of approximately 130 pounds is encountered, it may be due to improper closing of the steam regulating fuel valve, which will cause a fuel by-pass. Flush the dirt from the valve by removing cap and stem and passing a little fuel oil through the valve.

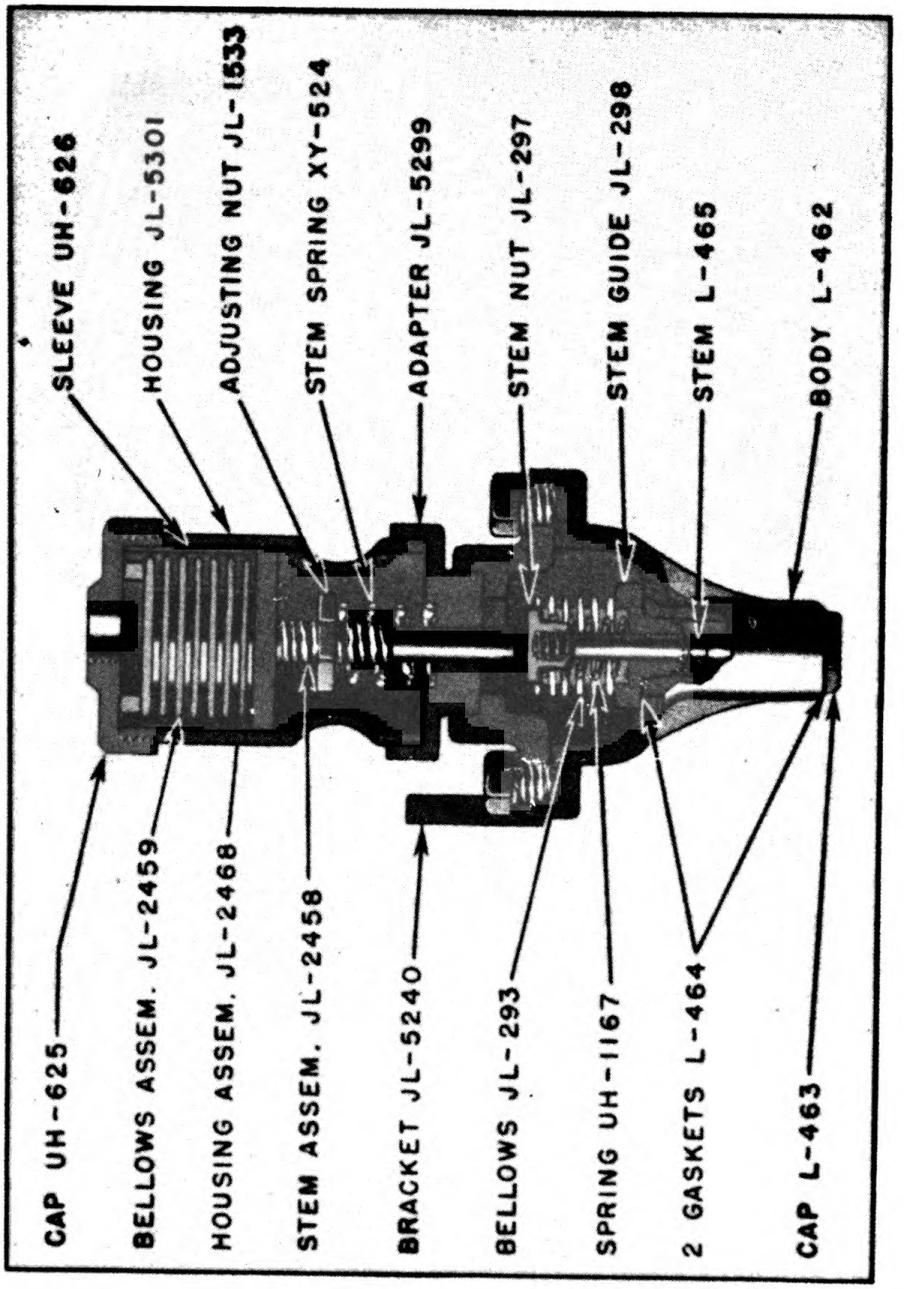


Figure 12 — Steam Regulating Fuel Valve

ORDNANCE MAINTENANCE

17. THE THERMOSTAT VALVE.

The thermostat valve, figure 13, serves both as an automatic fuel control valve or as a manual control of the fuel supply to the burner.

a. The thermostat valve will automatically control the steam pressure to a desired range by adjusting the handle. It will also automatically cut off the burner due to thermostat tube over-expansion in case of water failure by by-passing the full fuel supply back to the fuel storage.

CAUTION: In case the burner is shut down by the thermostat valve, check the water level in gage glass, water feed pump and lines before any attempt is made to re-adjust the thermostat valve.

b. The valve is in its full open position (allowing full fuel supply to the burner) when the handle is turned right (clockwise) until it is against the stop pin. All necessary mechanical adjustments are made at the factory.

c. To adjust thermostat valve: Turn the thermostat valve handle left (counterclockwise) to "OFF" position. Start plant with no fire. If burner ignites, shut down and reset the handle by removing the 3/8 in. set screw and turn the adjusting stem left (counterclockwise) 2 notches (1/3 turn). Replace the set screw, start plant, and recheck for cold setting. The fuel pressure should not rise above 40 pounds with the handle in the "OFF" position. After the "OFF" position is checked, operate the feed pump until the water level reaches half full in the accumulator gage glass. Turn the thermostat handle right (clockwise) to the "ON" position (against stop pin). If the fire modulates "OFF" and "ON" before 90 pounds steam pressure is reached, stop the plant, loosen the locknut, remove fuel line tubes, and unscrew (left) the valve body one turn. Tighten locknut, restart plant, and re-adjust handle as per above instructions if necessary.

d. To install thermostat valve: With the valve handle in 3/4 open position, screw the whole valve RIGHT (clockwise) into the mounting base until it is possible to blow freely through the fuel line connections on the valve. Back out (unscrew) the valve two full turns and secure in place with locknut.

18. THE FUEL PUMP.

The fuel pump, figure 14, supplies fuel oil to the burner under atomizing pressure.

a. The fuel pump pressure may be increased by turning the plug under the adjusting screw RIGHT (clockwise), and reduced by turning the plug LEFT.

b. Loss of suction may be caused by suction line not immersed deeply enough in oil, too much lift on suction line (maximum lift 15 ft.), leak in suction line, oil supply exhausted, suction line closed or

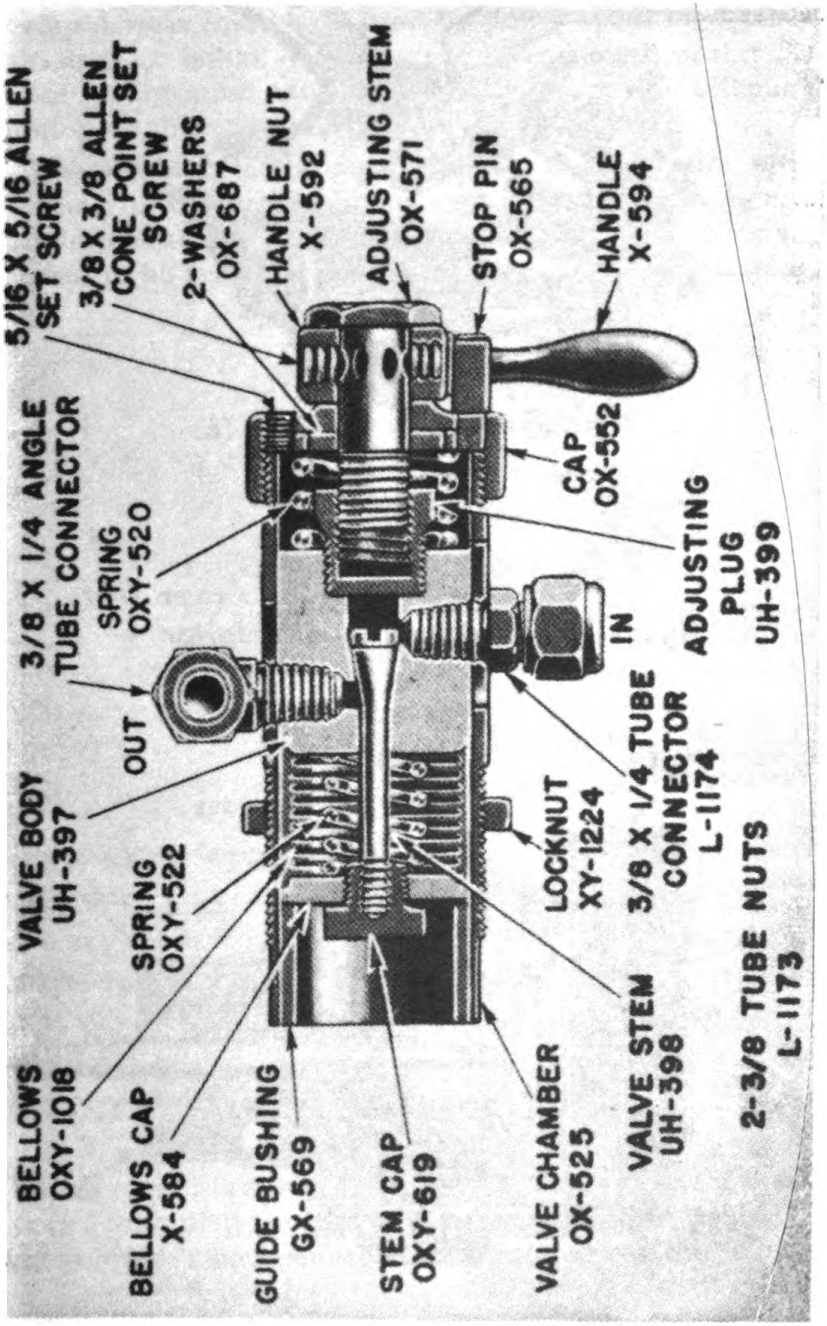
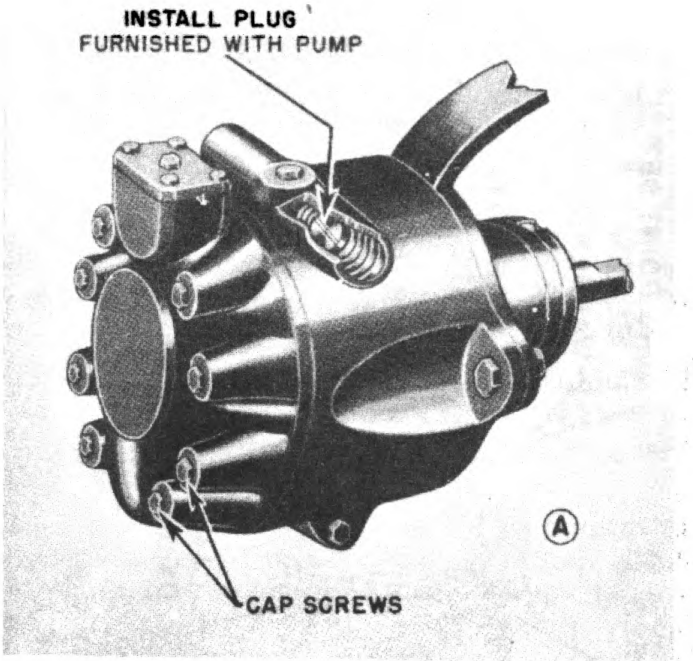
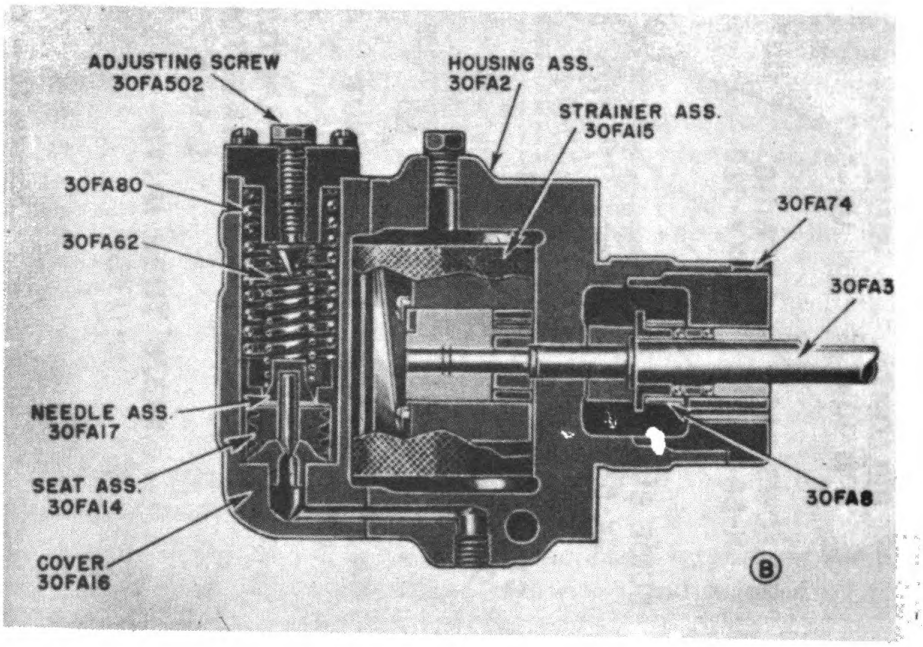


Figure 13 — Thermostat Valve



RA PD 39407

Figure 14 — Fuel Pump — a. Exterior



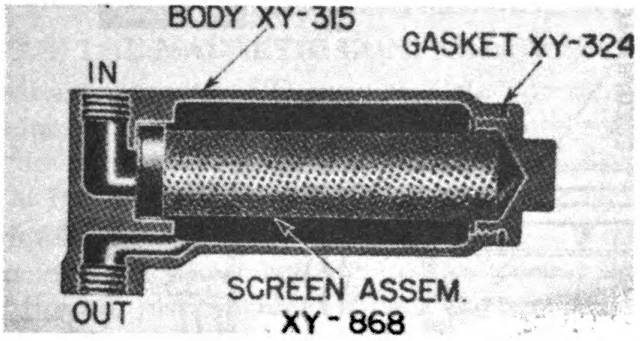
RA PD 39408

Figure 14 — Fuel Pump — b. Cross-section

too close to bottom of supply tank, and pump worn and allowing increased clearance between moving parts. Decreased capacity may be caused by any of the foregoing causes or by a variation in fuel oil viscosity.

c. Rapid wear may be caused by pump operating against excessive pressure, or failure of strainers to filter the grit or dirt out of the oil. The pump must never be allowed to operate without fuel oil circulation, as this will quickly score working parts.

d. The strainer in the pump will not need cleaning often if the fuel strainer in the suction line is kept in proper working order. To clean pump strainer, remove cap screws and cover. This will allow the screen to be removed and thoroughly cleaned by flushing.



RA PD 39409

Figure 15 — Fuel Strainer

19. THE FUEL STRAINER.

The fuel strainer, figure 15, is installed in the fuel suction line to remove any solids from the fuel before it enters the pump.

a. The fuel strainer requires no special care other than a periodic cleaning of the screen assembly. To remove the screen assembly, unscrew the cap on the bottom of the strainer.

20. STARTING AND STOPPING THE MOTOR.

a. To start motor, press the "ON" button of the pushbutton master, which establishes an electrical circuit to the closing coils of the magnetic controller, which closes (provided the pressure control switch is closed) and connects the motor across the line. See the wiring diagram, figure 16.

b. In event of excessive overload, the overload relay in the magnetic controller will trip. To reset the overload relay, allow one minute after the overload relay has tripped and press the "RESET" button on the front of the magnetic controller.

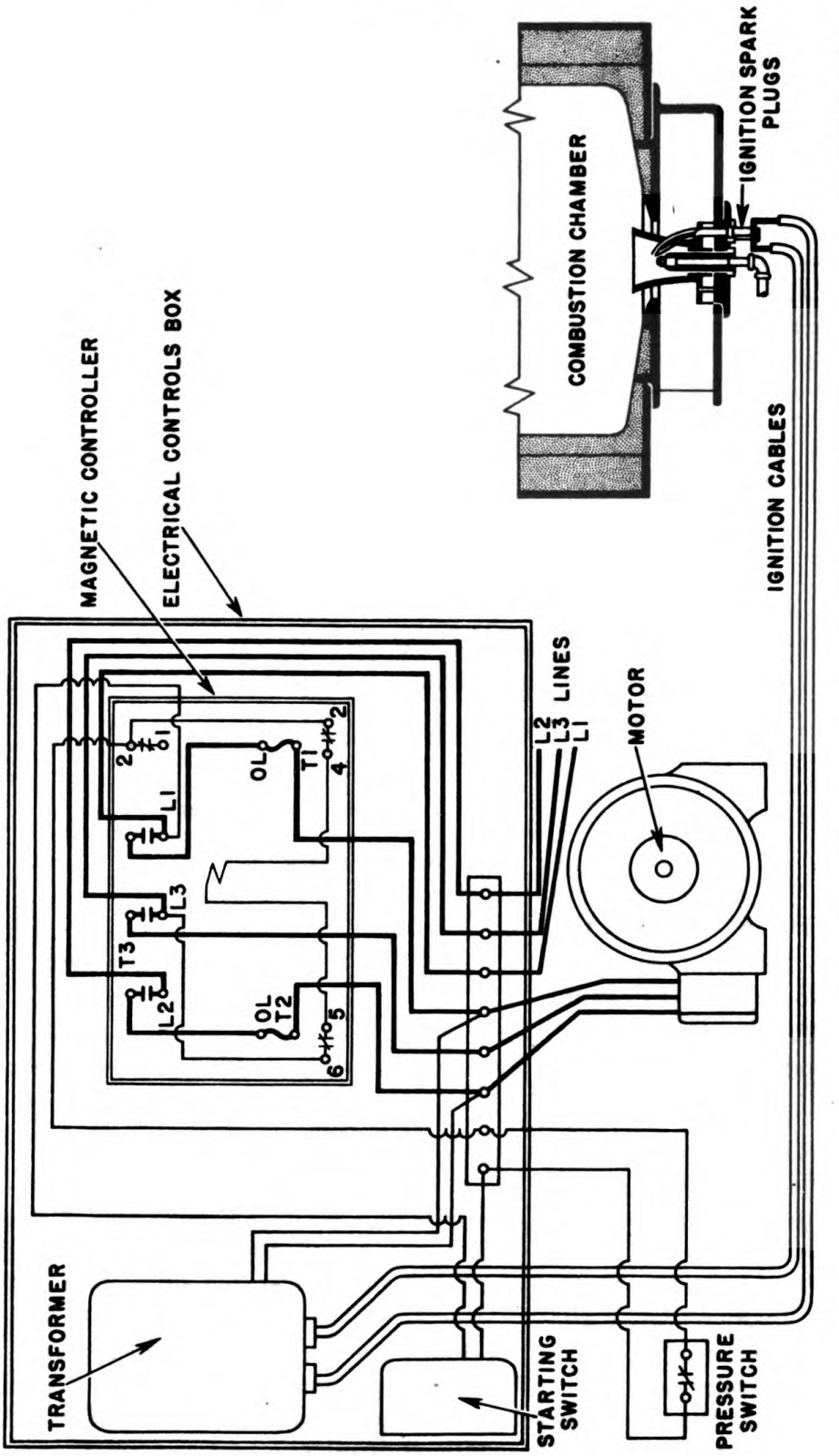


Figure 16 — Wiring Diagram

c. In event of voltage failure, the motor will stop but will restart upon restoration of voltage, provided the pushbutton master is in the "ON" position.

d. The pressure control switch, paragraph 22, is used to automatically start and stop the motor in response to changes in plant steam pressure.

e. To stop the motor, push the "OFF" button of the pushbutton master.

f. The electric motor is a standard General Electric Motor, Model 5K63AC683B, ½ hp Number 63A frame, 1425 rpm 220 volt alternating current, 3 phase, 1.8 amperage.

g. The magnetic controller, figure 17, automatically connects motor across line and puts all electrical auxiliaries in operation when pushbutton master is in the "ON" position.

21. CARE OF THE MAGNETIC CONTROL SWITCH.

a. The silver contacts (12) require little attention, but must be replaced before the tip wear allowance is completely gone. Filing or otherwise "dressing" the tips results in loss of the silver and is of no advantage as far as operation and tip life are concerned.

b. To determine when a maximum wear of contact tips is reached, remove the power and lift up the lower magnet (4) until the contact tips are just touching. Check the gap between stationary and movable contacts on both outside poles. If this gap is less than $\frac{1}{32}$ in. on either leg, tips are worn to such an extent that they should be replaced.

c. Movable contacts (12) are assembled on a molded support which can be taken out by removing support holding screws (11). When the support (10) is removed from the switch, depress the contact bar, remove the bronze yoke that retains the contact bar, and remove the contacts and contact spring from the supporting post.

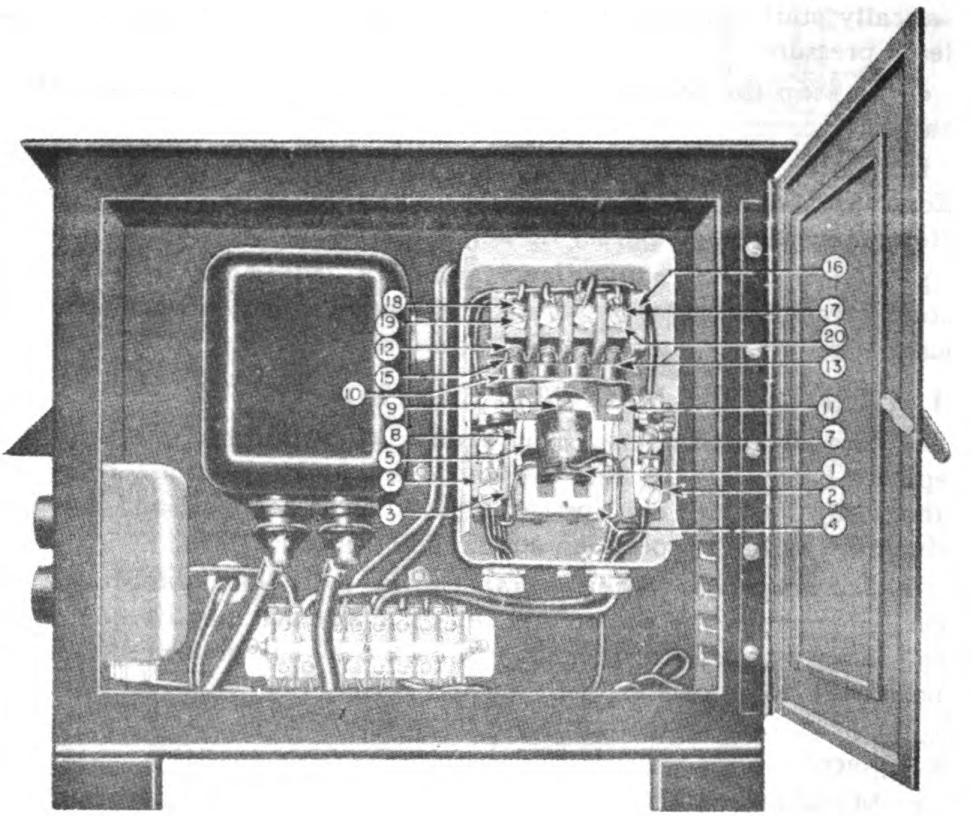
d. Stationary contacts (17 and 18) are removed by loosening the terminal binding screw (19) which holds the stationary tip in place.

e. To remove the coil, loosen and remove the single coil retaining screw (9) located just above the solenoid coil, and lift out the engine magnet and coil assembly.

f. The overload relays provide motor protection on overload, including stalled motor. The overload relay requires a delay of approximately one minute before resetting after it has tripped on overload. To reset, press the "RESET" button on the front of the controller.

22. THE PRESSURE CONTROL SWITCH.

a. The pressure control switch, figure 18, adjusts the operating pressure. To raise the operating pressure, increase the tension on the



RA PD 39411

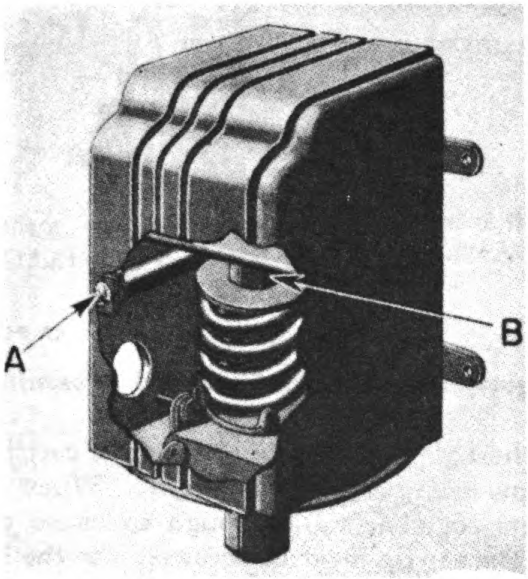
1—Solenoid cell
2—Reset frame
3—Frame
4—Lower magnet
5—Upper magnet
7—Operating plate, right-hand
8—Operating plate, left-hand
9—Coil retaining screw
10—Molded supports for movable contacts
11—Support holding screw
12—Movable contact
13—Movable contact compression spring
15—Retainer for movable contact
16—Stationary contact support
17—Stationary contact (front)
18—Stationary contact (rear)
19—Binding screw for stationary contact
20—Terminal clamp for binding screw

RA PD 39411A

Figure 17 — Magnetic Controller

range spring by turning the adjusting nut to the RIGHT (clockwise). To lower the operating pressure range, turn the nut to the LEFT (counterclockwise).

b. Do not attempt to adjust this switch for a differential less than 10 pounds. To widen the range, turn the adjusting screw to the RIGHT (clockwise). If this causes the switch to cut out, the nut may be readjusted. If differential adjustments are set closer than 10 pounds, snap action of the contacts will be impaired.



RA PD 39412

Figure 18 — Pressure Control Switch

23. IGNITION ELECTRODE POINTS.

a. The points on the ignition electrodes in the burner manifold assembly, figure 19, should be kept free from carbon and in proper alinement with a gap of $\frac{5}{32}$ in. Should readjustment be necessary, dress the points with a fine file so that the vertical chisel edges of the electrodes are located as per the dimension shown on the drawing.

CAUTION: When adjusting ignition points, be sure pushbutton master switch is in the "OFF" position.

b. Check the spark by running the motor with no fire. Spark should be visible and strong. If fire fails to light, check the burner tip for clogging.

24. THE BURNER TIP.

a. The burner tip, figure 20, is of the left-hand atomizing type. The slots in the cartridge are 0.0175 in. depth. The nozzle is hand reamed (No. 75 drill). The burner tip passes approximately 3 gallons of fuel per hour at normal fuel line pressure.

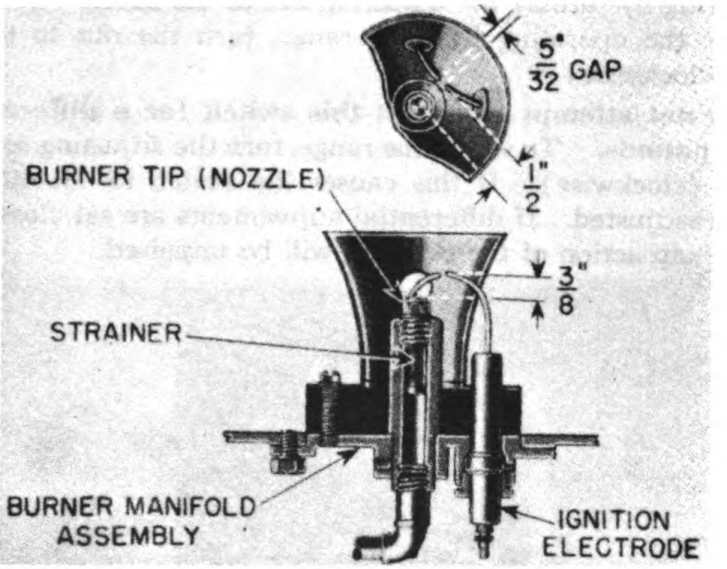


Figure 19 — Burner Manifold Assembly

b. To clean the tip, disassemble the nozzle, cartridge, and screen assembly and blow each part out thoroughly. When reassembling do not put the parts together tight enough to cause gilling. Merely tighten snugly. Burner tip must be screwed into the burner manifold tightly.

25. INSTRUCTIONS FOR TYPE-30 AIR COMPRESSORS.

a. The electric powered and the gas powered compressors are the same. They are both connected into the air system through valves. Generally both receiver valves should be open to take advantage of the doubled receiver capacity.

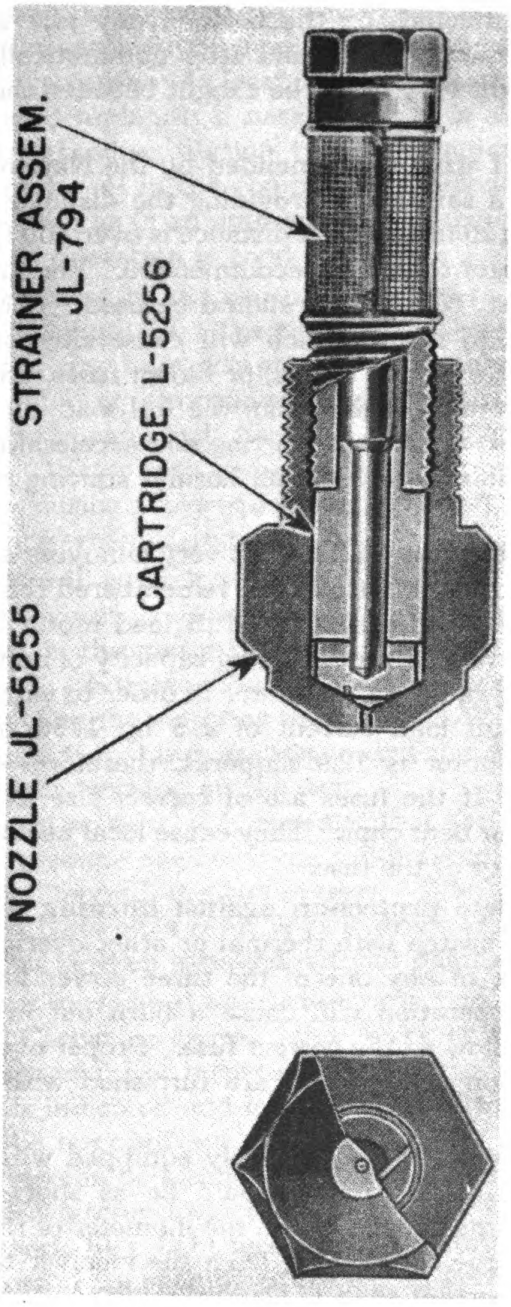
b. The electric motor is protected by the circuit breaker located on the wall over the compressor, and controlled by the automatic switch which shuts it off when the desired tank pressure is reached.

c. The gas engine is not automatic. The magneto short circuiting switch must be turned to the "RUN" position and the engine cranked by hand. When the desired pressure is reached, the engine may be stopped by turning the switch to the "STOP" position or will be automatically shut off by the pressure switch.

d. Before starting for the first time:

(1) Fill the crankcase with SAE 30 engine oil up to the filler hole. Check the motor bearings for lubrication. See sub paragraph i.

(2) Turn compressor over a few revolutions by hand to see that everything is free and in working condition.



RA PD 39414

Figure 20 — Burner Tip

(3) Check the tension of the belts. See sub-paragraph **k.**

(4) Remove tools, rags, and any other objects from the vicinity of the compressor before throwing in the switch.

(5) Never put hands on the belts of any idle units. The compressor is connected to start and stop automatically and should it start, a hand might very easily be caught between the belt and one of the pulleys.

e. The size of wire recommended by the National Board of Fire Underwriters is a safe guide providing the distance from the feeder does not exceed 100 feet. If the distance is over 100 feet, use wire that is three times larger than that recommended. For this 5 hp motor on 220 volts, 3 phase, No. 12 wire should be used. Otherwise, a serious loss in voltage will result, which will cause sluggish operation, frequent tripping of overload relays, or blown fuses. Since the starting current is considerably higher than the full load current, the voltage drop is aggravated during the starting and accelerating period so that the motor is unable to develop its normal starting torque when it is most needed.

f. Frequent blowing of fuses is very annoying and is usually due to fuses being too small. It must be remembered that the momentary starting current is higher than the full load motor current and that the fuses must have a current carrying capacity of approximately three times the current rating of the motor in order to carry this load. For example: the full load current of a 5 hp 1750 rpm, 3 phase, 60 cycle, 220 volt motor is 12.9 amperes; therefore, 40 ampere fuses should be used. If the fuses are of correct size and still burn out, inspect for weak or bent clips. They cause local heating which reduces the actual capacity of the fuse.

g. For complete protection against burning out the motor, a separate starting switch with thermal or other overload relays should be used. Failure of any one of the three power lines to a 3 phase motor while in operation will cause a burn out in the motor very quickly without blowing the correct fuse. Proper overload relays will give the protection desired and are furnished with instructions for installation.

h. The compressors are regularly equipped with an intake muffler and filter. Intake piping should be as short and straight as possible and as large or larger than the diameter of the intake connection. The discharge connections from the receiver to the equipment are far more important than is usually realized. Small leaks in the discharge system are the largest single cause of excessive running on time. Consequently, discharge piping should be made absolutely tight. If the compressor runs more than you believe it should, the most likely cause is a leaky pipe-line. Leaks are easily located by squirting oil around the joints.

TIRE REPAIR AND RETREAD

i. A restricted intake is the second cause of excessive running on time. If the compressor is subjected to high atmospheric temperatures (100° F. and above, as when located near a boiler), or where the compressor operates continuously, SAE 30 engine oil is recommended. For outside installations in freezing weather it is necessary to use SAE 10 engine oil plus kerosene. At least once a week, check the oil level of the crankcase and replenish if necessary. It is not subject to the extreme heat and gasoline dilution that is common to automobile engines; therefore, the oil in the compressor crankcase will not have to be changed as often as in an automobile. Changing oil once every 500 hours of actual operation is good practice.

j. The receiver must be drained once a week to remove the condensate that will accumulate. The receiver collects vapor that condenses after the air has been compressed and cooled. The amount will vary with different atmospheric conditions. If draining the receiver is neglected, water will rise to a point where it passes into the service lines. Water also reduces the effecting volume of the receiver, thereby causing too frequent starting and stopping. Open the drain valve wide when draining.

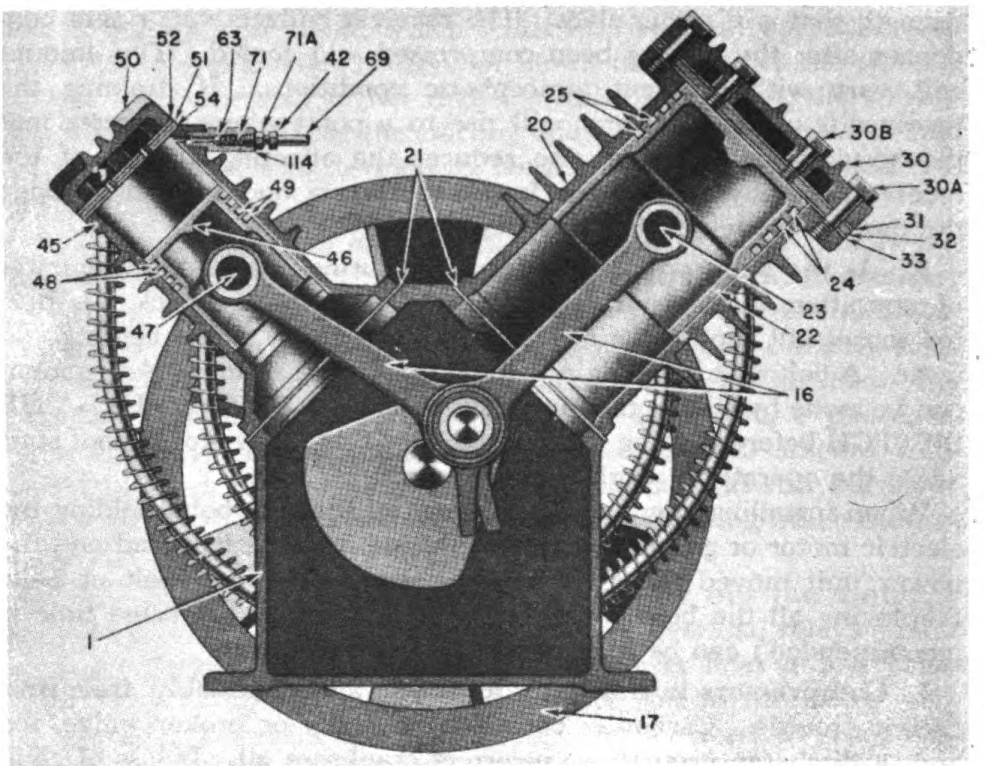
k. As the belts will stretch slightly during the first few months of operation, a provision is furnished for taking up slack. A belt, too loose, will slip on the motor pulley and cause undue heating and wear. A belt that is too tight will overload the bearings. Adjustment can be made by sliding the motor on its base. ALWAYS PULL THE SWITCH before starting this operation so that the motor cannot start while the operator is working on the unit.

When installing new belts, it is essential that the bolts holding the electric motor or gasoline engine to the sub-base be loosened and the power unit moved toward the compressor. The new belt or belts (replacing all the belts on a multi-V-belt drive at the same time is recommended) can be then installed without damage.

l. Compressors in normal operation are reasonably free from carbon trouble. Carbon is caused by a leaky or broken valve, too high a discharge pressure or incorrect crankcase oil. If loss of compressor capacity is indicated and it can be traced to no other reason, the head should be removed and cleaned.

The finger valves can be cleaned by taking out the valve plate and removing the two cap screws which hold the valve fingers. Clean the valves and their seats by a light scraping or stiff brushing. Type "K" valves can be cleaned by soaking overnight in kerosene followed by a stiff brushing. Be sure the valve is thoroughly dry before replacing.

m. The inlet air for a compressor must be clean to prevent the working parts from wearing out prematurely. If the filter becomes clogged with dirt, it restricts the intake and reduces the capacity of the compressor. On type 30 compressors the cleaner must be re-



RA PD 39415

Figure 21 — Compressor Assembly — a. Section Through Cylinders

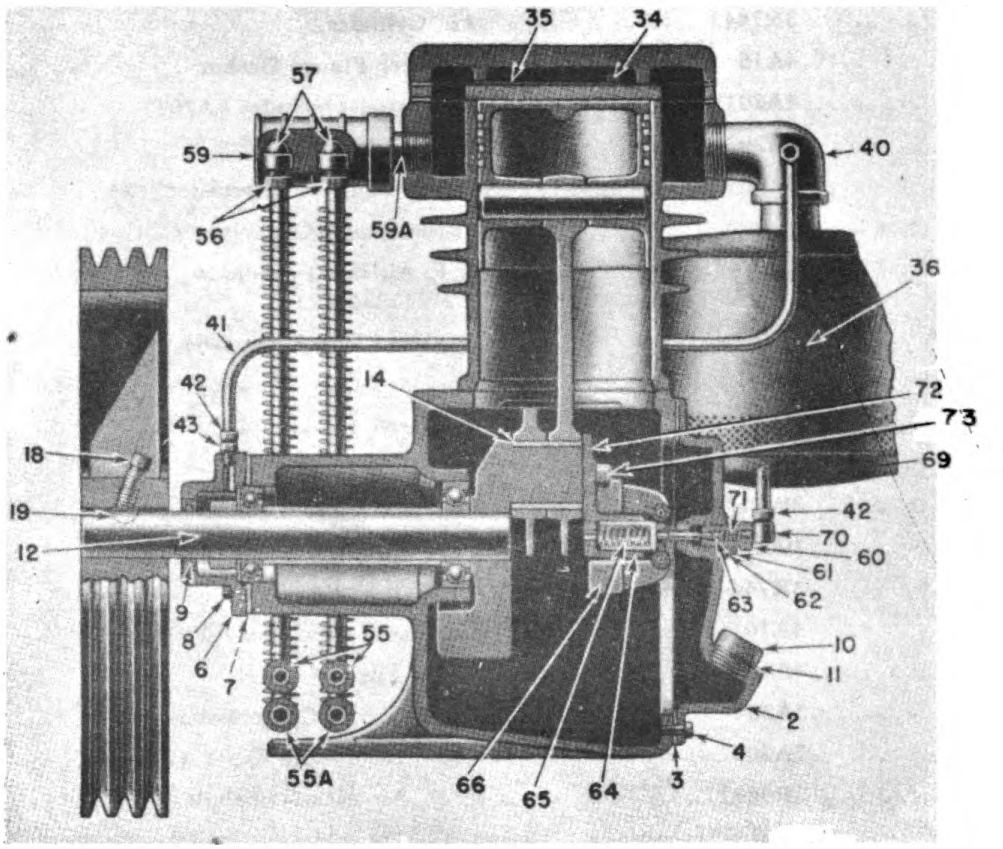
TIRE REPAIR AND RETREAD

KEY TO NUMBERS AND NOMENCLATURE OF FIGURE 21A

Compressor Assembly (section through cylinders)

Key No.	Part No.	Nomenclature
1	3H5528	Frame
16	4A35	Connecting Rod (2)
17	4A50	V-Belt Wheel (includes Key and Set Screw)
20	3R7443	Air Cylinder
21	4A15	Cylinder Flange Gasket
22	4A201	Air Piston (includes 4A202)
23	4A202	Piston Pin
24	4A204	Piston Ring—Compression (2)
25	4A205	Piston Ring—Oil Wiper (2)
30	3R7445	L. P. Air Head—includes 3W11316 (2)
30A	½-in. x 1¾-in.	Air Head Cap Screw (6)
30B	⅜-in. x 1 in.	Air Head Cap Screw (2)
31	3W11316	Air Head Gasket (2)
32	3W11315	Air Head Spacer
33	3W11317	Air Head Spacer Gasket
42	100X5	Tube Nut (2)
45	3R7444	Air Cylinder
46	4A101	Air Piston—includes 4A102
47	4A102	Piston Pin
48	2A204	Piston Ring—Compression (2)
49	2A205	Piston Ring—Oil Wiper (2)
50	3R4081	H. P. Air Head—includes 3W6870 (2)
51	3W11627	Air Head Spacer
52	3W6870	Air Head Gasket (2)
54	3W6869	Air Head Spacer Gasket
63	2A605	Valve Steel Ball
69	5/16-in. x 18-in.	Pilot Valve to Cylinder Relief Valve Tubing, including 100X5 (2)
71	PP336	Valve Spring
71A	3W11365	Cylinder Relief Valve Tube Connector
114	2A651A	Cylinder Relief Valve Body

RA PD 39415A



RA PD 39416

Figure 21 — Compressor Assembly — b. Section Through Crankshaft

TIRE REPAIR AND RETREAD

KEY TO NUMBERS AND NOMENCLATURE OF FIGURE 21B

Compressor Assembly (section through crankshaft)

Key No.	Part No.	Nomenclature
2	3R7446	Frame End Cover
3	4A4	Frame End Cover Gasket
4	5/16-in. x 3/4-in.	Frame End Cover Cap Screws (6)
6	3W11313	Shaft End Cover—includes X13T536
7	3W11319	Shaft End Cover Gasket
8	5/16-in. x 3/4-in.	Shaft End Cover Cap Screws (4)
9	X13T536	Shaft End Cover Oil Retainer
10	3W82	Oil Filler Plug
11	5A7	Oil Filler Plug Gasket
12	4A29A	Crank Shaft Complete (includes Bearings and Bearing Spacer)
14	4A32	Crank Pin Bushing
18	1/2-in. x 1 1/4-in.	Belt Wheel Set Screw—Sq. Head Cup Point
19	No. 17	Belt Wheel Kay—Woodruff
34	1/4-in. x 1/4-in.	Fillister Head Screw and Washer (4)
35	3W6874	L. P. Valves—Inlet and Discharge (4)
36	4A250A	Air Head Muffler and Cleaner
40	4A221A	Inlet Muffler Elbow
41	5/16-in. x 17 in.	Breather Tube—includes 100X5 (2)
42	100X5	Tube Nuts (2)
43	200X5	Tube Connector (2)
55	1/2-in. x 29 in.	Copper Finned Tubing (2)—includes 100X8 (4)
55A	1/2-in. x 37 in.	Copper Finned Tubing (2)—includes 100X8 (4)
56	100X8	Tube Nuts (8)
57	400X8	Tube Elbow (8)
59	3W11560	Intercooler Connection (2)
59A	1 in.	Close Nipple
60	2A601A	Pilot Valve Body
61	2A602A	Pilot Valve Body Lock Nut
62	2A603	Pilot Valve Body Lock Nut Gasket
63	2A605	Valve Steel Ball
64	2A606	Centrifugal Unloader Plunger
65	PP311	Unloader Plunger Spring
66	2A608	Unloader Weight (2)
70	400X5	Tube Elbow
71	PP336	Valve Spring
72	4A33A	Crank Pin Cap
73	3/8-in. x 7/8 in.	Crank Pin Cap Screw (2)

RA PD 39416A

moved and washed in gasoline before the filtering element becomes sufficiently clogged to cause restriction. After all the gasoline has evaporated from inside of filter, dip in SAE 10 engine oil, drain well, and replace. IF GASOLINE OR KEROSENE IS USED IN CLEANING ANY AIR INTAKE FILTER, BE SURE IT IS THOROUGHLY DRY BEFORE REPLACING; OTHERWISE IT MAY CAUSE AN EXPLOSION.

n. Pressure switches are used on both the electrically powered automatic start and stop unit and the gasoline driven unit. Do not operate the compressor at a pressure higher than actually needed. To change the working pressure, remove the cover and turn the adjusting nut to increase or decrease the tension on the spring. It is advisable to have as wide a differential as possible to avoid frequent starting and stopping of the compressor.

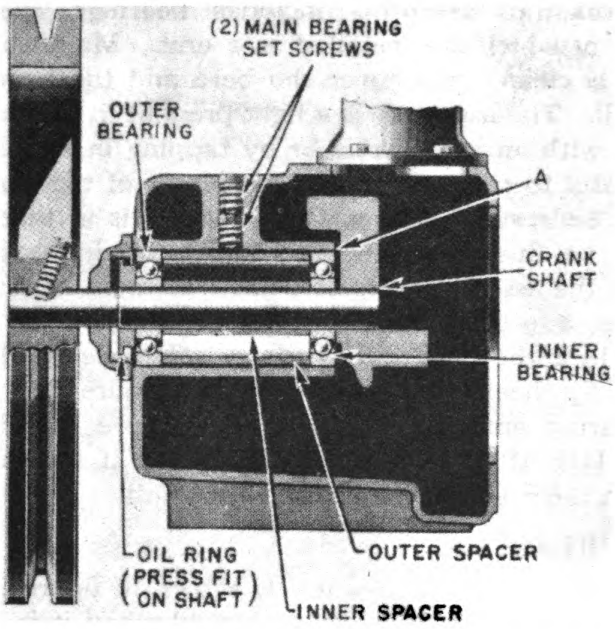
o. The safety valve is set to blow off at about 10 pounds above the normal operating pressure. It is not safe to increase this blow-off pressure, but it may be decreased if the adjustment on the pressure switch is reduced. If the safety valve sticks, disassemble and clean.

p. Overheating of the electric motor is usually caused by low line voltage or a serious overload. A proper overload relay will protect the motor against damage from overheating by turning off the power.

q. To prevent an accumulation of foreign matter it is good practice to periodically blow off the motor windings with a jet of air. A spray of carbon tetrachloride is an excellent cleaner. An occasional revarnishing of the windings will greatly prolong the life of the motor. NEVER OIL THE COMMUTATOR OR SLIP RINGS ON ANY ELECTRIC MOTOR! Any oil or grease will collect dirt or carbon from the brushes and eventually result in a short circuit. If the commutator becomes dirty it should be cleaned by a competent electrician.

If it is ever necessary to renew the brushes, they must be carefully fitted to the contour of the commutator with fine flint paper, and must fit loosely in the holders. DO NOT USE EMERY CLOTH.

r. If it is ever necessary to replace piston rings, a complete new set should be installed. Compression rings should be assembled over top of piston and oil rings over bottom of piston. Put on the outer rings first and work the inner rings over them. Stagger the ring joints. End clearance of .005 in. to .010 in. is required for all rings when compressed in groove to allow for expansion. After installing new rings, run the compressor with heads off to see if any oil is passing by the rings. If any oil appears, lap in the rings by applying a mixture of Bon-Ami and lubricating oil to the cylinder wall. Run the compressor until oil stops passing the rings. Wipe out cylinder and crankcase and assemble the unit.



RA PD 39417

Figure 22 — Crankshaft — Drive End

s. The purpose of the centrifugal unloader, figure 21, is to exhaust the pressure from the high pressure cylinder when the compressor stops so that the compressor is unloaded when it starts again. This is done by means of an air connection between the high pressure cylinder and the crankcase, controlled by the cylinder relief valve and the pilot valve.

(1) When the compressor starts and comes up to speed, the unloader weights fly out, pushing the unloader plunger inward, allowing the ball in pilot valve to seat. This shuts off the air connection to the cylinder.

(2) As the compressor stops, the weights close and the unloader weight springs open unseating the ball which allows pressure to escape from the cylinders through the relief valve and tubing to the crankcase.

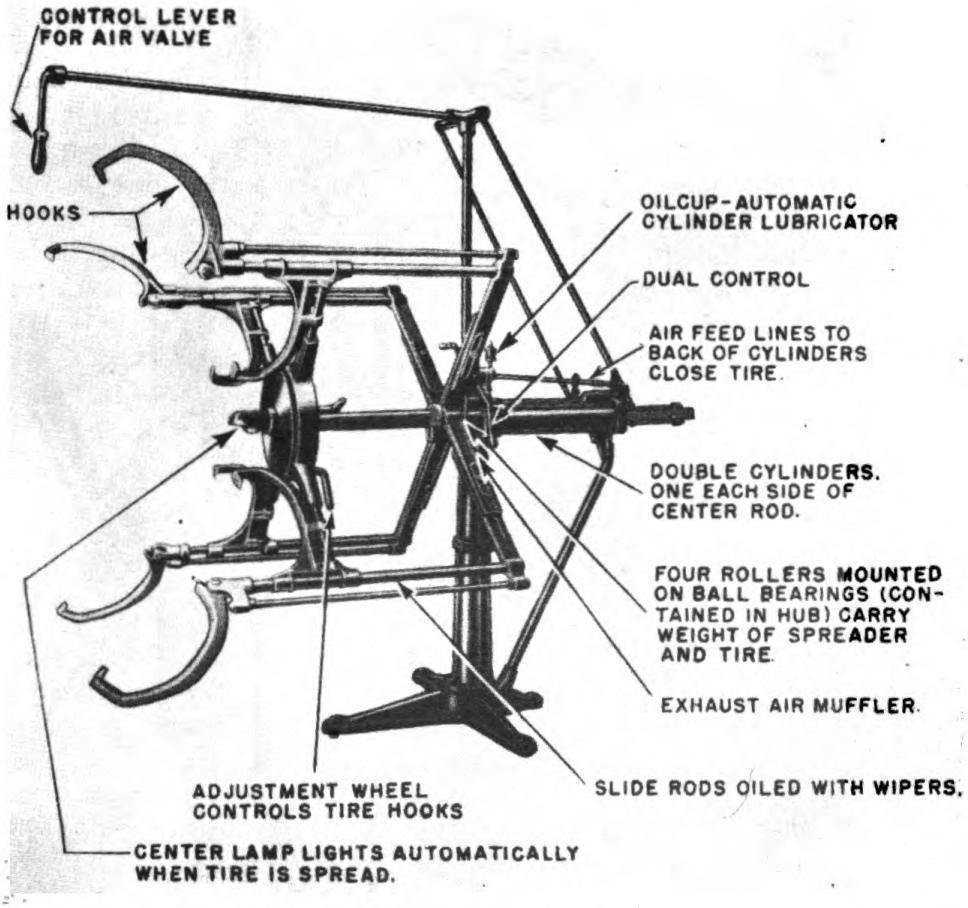
(3) Should adjustment ever be necessary, remove the tube elbow and spring from the pilot valve body and release lock nut. With a pencil, push the ball down against resistance of unloader weight spring until it is seated. Mark its position on the pencil on a line with the outer edge of the body. Allow ball to back off its seat and mark this position on the pencil. There should be $\frac{1}{16}$-in. between the marks on the pencil. If less than this, screw in the unloader valve body; if more, turn it counterclockwise until $\frac{1}{16}$-in. is reached. Then tighten lock nut and replace spring and elbow.

t. **The crankshaft assembly** includes bearings, spacers, crank disks, etc., all of which are installed as a unit. Make sure the main bearing bore is clean; then cover the bore and the bearings with a light film of oil. The assembly is a light press fit in the bore and may be pressed in with an arbor press or by tapping in with a lead hammer. Be careful to press or tap on the center of the shaft as otherwise it might be sprung. When the assembly is in place, the inner bearing must be flush with the face of the main bearing bore at "A". To lock the assembly in place, turn the main bearing set screw in until it bites into the outer main bearing spacer. Put in a second set screw to lock the first one in place. Replace shaft end cover. Drive on the flywheel and check again to be sure that the edge of the inner bearing and the face of bearing bore are flush at "A", figure 22. THIS IS VERY IMPORTANT. If the assembly has moved, loosen the set screws and reset the shaft.

26. TIRE SPREADERS.

a. **The Kehawke Tire Spreader** is shown in figure 23. The oil cup should be filled with SAE 10 engine oil when it is less than ¼ full. Normally the oil should last about two weeks. If the unit is operated on a 24-hour schedule, that time will be cut in half. The rate of oil flow is adjusted by a screw located on top of the cap. Once a month, twice if on a 24-hour day, the slide rod wipers should be oiled through the oil holes. Twice a year, the adjustment wheel gears should be repacked with No. 2 general purpose grease. The machine should always be kept clean and there should never be air leaks. If the machine becomes stiff, sluggish, or jerky, all rods and pins should be cleaned, oiled, and wiped dry with a clean cloth. This machine is adjustable to various rim sizes. Before putting a tire in, the adjustment should be closed to slightly smaller than the rim size. Then open the outside hooks and hang the tire on an inside hook, inside the corresponding outside hook. Do not lift sizes larger than 7.50x16 to the full height of the machine. Serious internal damages can result. Roll the machine so that the hook is at the top and place the tire over the other hooks. Close the lower outside hooks, revolve the machine so that the other hooks will be at the bottom and close them. Make sure all hooks are over the bead. Then open the adjustment to bring the lower hooks to about ¼ inch of the bead. Do not force them tight. With either the control lever in front of the machine or the dual control at the sides, open the tire. The inspection light is turned on automatically when the machine is opened.

b. **The Manley tire spreader** is shown in figure 24. This machine requires cleaning and oiling the moving parts with SAE 30 engine oil about every two weeks of service. About two ounces of Neat's foot oil should be kept in the cylinder. If either of the foot-



RA PD 39418

Figure 23 — Kehawke Tire Spreader

operated valves should develop a leak, it may be corrected by replacing the composition washer under the valve disk screw. The tire is put in by leaning it against the machine and lifting the part still on the floor. Do not pick up heavy tires. Pull down the upper support and put the tire over it, with the roller between the beads. Adjust the fingers by placing the pin in the appropriate hole so that the hooks fit over the beads. Push the fingers down tight and open the valve by pushing the right pedal. The left pedal closes the tire.

27. LODI MOLDS.

There are two models of the Lodi mold. Model F-2A is illustrated in figure 25. They are bolted to the floor and connected to the steam line with flexible metallic hose. If the hose is disconnected, it must be reconnected without any twist. The molds are also connected to the compressed air line, which is used for opening and

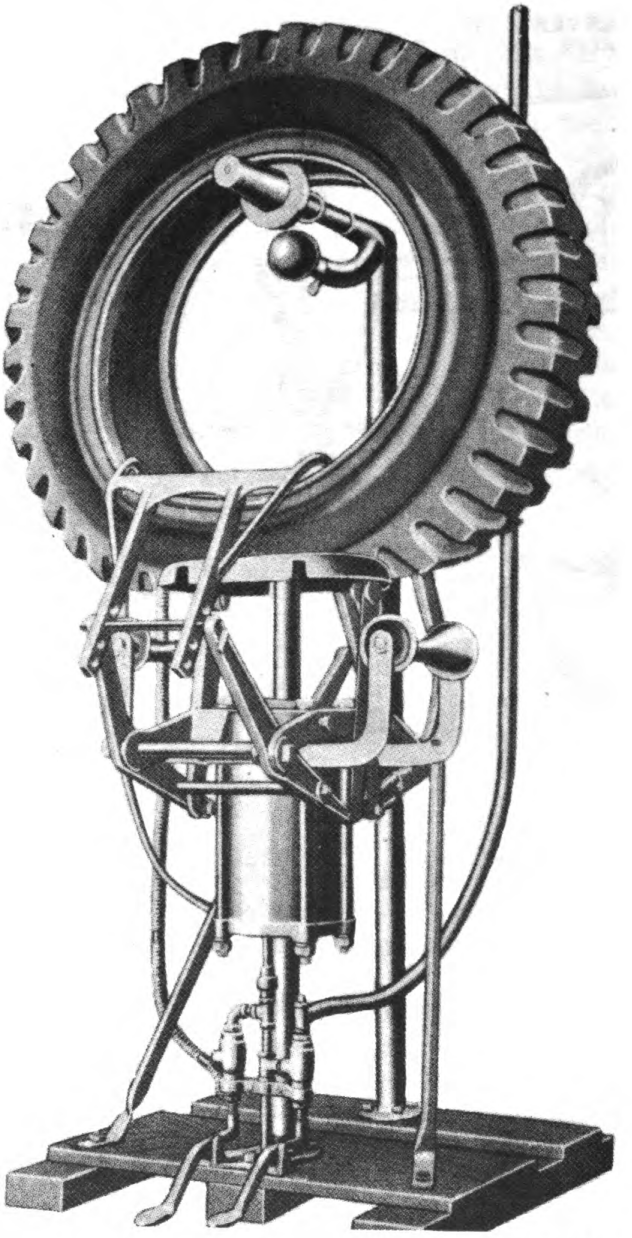


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Figure 24 — Manley Tire Spreader

closing. *When not in use, the molds should be kept closed.* Otherwise condensate will accumulate. Opening and closing is controlled by an "up" and "down" valve, and the mold is locked closed by bolts. It is essential that all bolts be swung out of the forks before the "down" or open valve is operated. The forks, particularly those in the hinge side, can be broken.

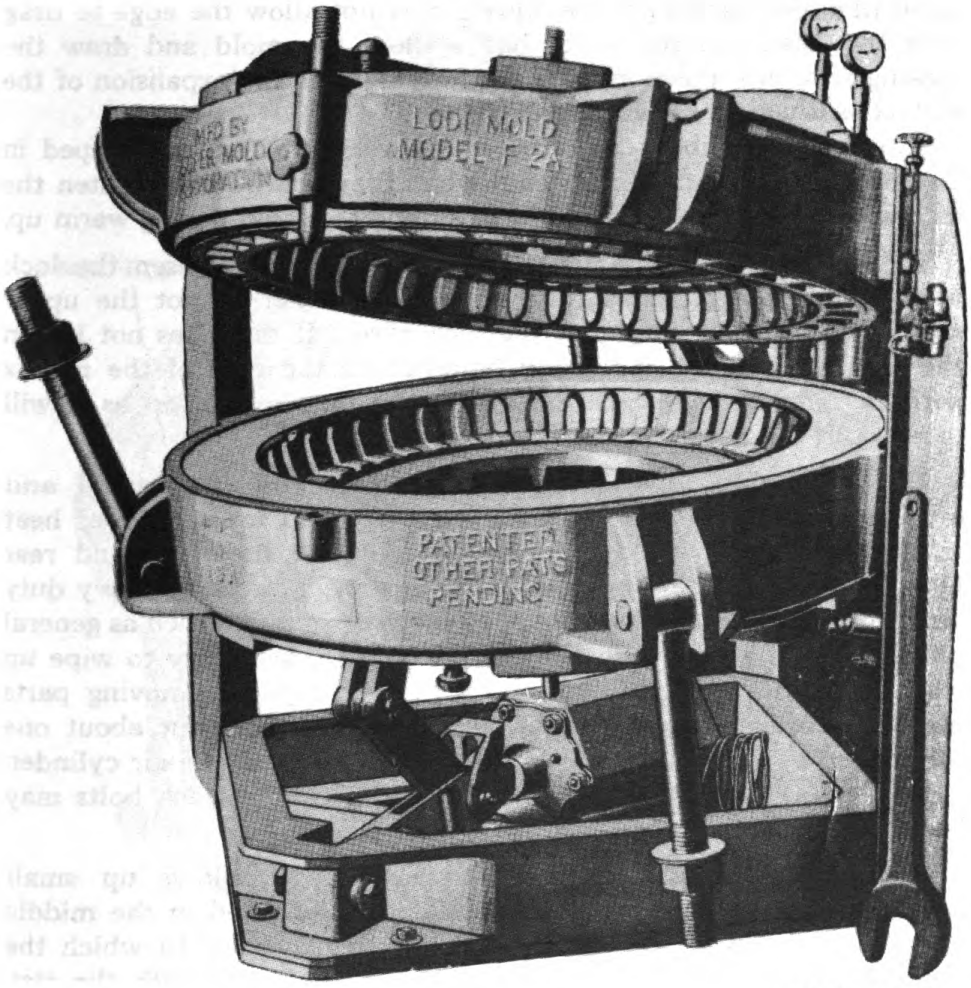


Figure 25 — Lodi Mold, Model F-2A

a. Cold molds must be warmed up for 15 to 20 minutes with the steam valve opened about ¼ turn. Do not open the valve wide during the warm-up period. When the skirt of the steam chamber becomes hot, open the valve all the way and bleed off any condensate through the bleed cocks. Matrices should be warmed with or in the hot mold before being used. The steam trap should be frequently checked by opening the pet cock. Steam should escape in puffs. Traps may fail due to dirt lodged under the seat; frequently the dirt may be dislodged by tapping lightly.

b. To install matrices, open the mold and loosen the locking wire. Slide the lower half in the bottom steam chamber, matching the center line to the mark on the mold. Slide the upper half on top of the lower half, matching the mark to the one in the lower half.

Slide this half parallel to the lower. Do not allow the edge to drag over the design in the lower half. Close the mold and draw the locking wire into position. Do not lock tight as the expansion of the matrix as it warms up will break the wire.

After allowing about 20 minutes for warm up (water dropped in the matrices will burst into steam when they are warm), tighten the lock wire. Time can be saved by clamping the mold during warm up.

c. To remove the matrices, close the mold and loosen the lock wire. Open the mold slightly and note whether or not the upper matrix is loose. If not, work the lock wire. If this does not loosen the matrix, open the mold and hammer on the face of the matrix *with the gloved hand.* Do not allow the matrix to drop as it will dent. Lift out the lower half.

d. The inside of the steam chambers and the inside and outside of the matrices must be kept clean to insure proper heat transfer. Once a week, the mold hinges and the front and rear hinge pilot should be lubricated with a grease gun, using heavy duty wheel bearing grease. If grease of lower melting point, such as general purpose No. 2 grease, must be used, it will be necessary to wipe up what has melted out and renew. Other linkage and moving parts may be lubricated with engine oil. Once a month, put about one tablespoon of SAE 10 engine oil in the plug hole on the air cylinder. *Do not allow any oil to drop on the matrices.* The lock bolts may be kept lightly coated with graphite.

e. Adjustable rims are for the purpose of taking up small differences in actual sizes of tires. They are divided in the middle and the tire may therefore be dropped over the half to which the bolts are connected, being careful to aline the valve with the slot. The other half is then put on and the bolts drawn up evenly, to the amount as indicated by the tire measurement. Particular care must be taken to see that these rims are not sprung or dented.

f. The tire may be slid into the lower matrix, with the valve convenient to the air hose. All tires should be centered and forced into the lower half as far as possible, and the mold closed. Closing will force the tire evenly into both matrices.

g. To remove the tire, remove the air coupling from the tube and wait until it is deflated. *No valve core is to be used.* Then unlock the clamp bolts and open the mold slightly. Tire will come out of one matrix half. Hook the removing hook to the rim and to the half from which the tire is free. Pull the tire slowly, by opening the mold.

h. Sub-pressure plates are provided to relieve the tire sidewall of excessive strain. These are used only with the matrices for which they are marked.

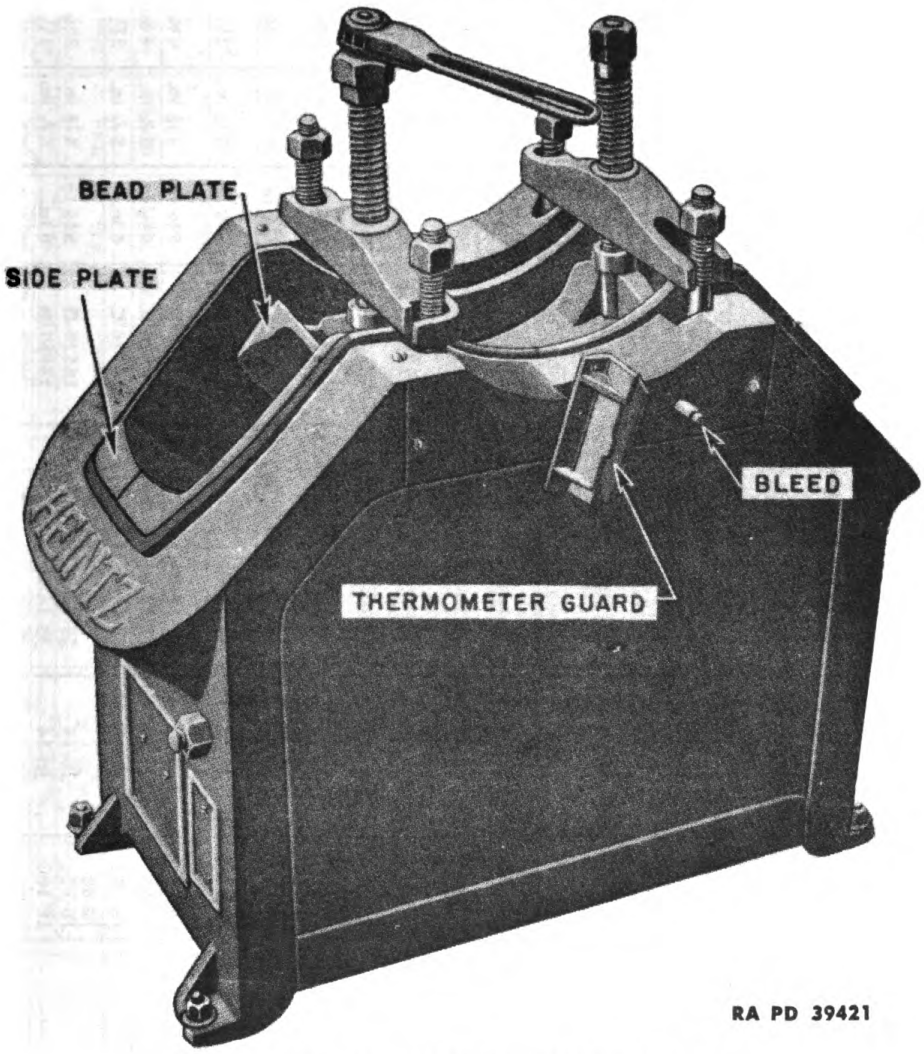


Figure 26 — Heintz Section Mold

i. Temperature gages on these molds should at all times correspond to the line pressure. Variation indicates accumulations of water or line restriction. All valves must be fully open, and after inserting a cold tire, it is recommended that the bleed cocks be opened for a few seconds. All molds are fitted with traps and strainers which are described in paragraph 13.

28. SECTION MOLDS.

a. A Heintz Section Mold is illustrated in figure 26. When these molds are bing warmed up, the air release valve should be left open until steam escapes.

b. The following table, figure 27, is the recommended parts components to fit the tire sizes indicated:

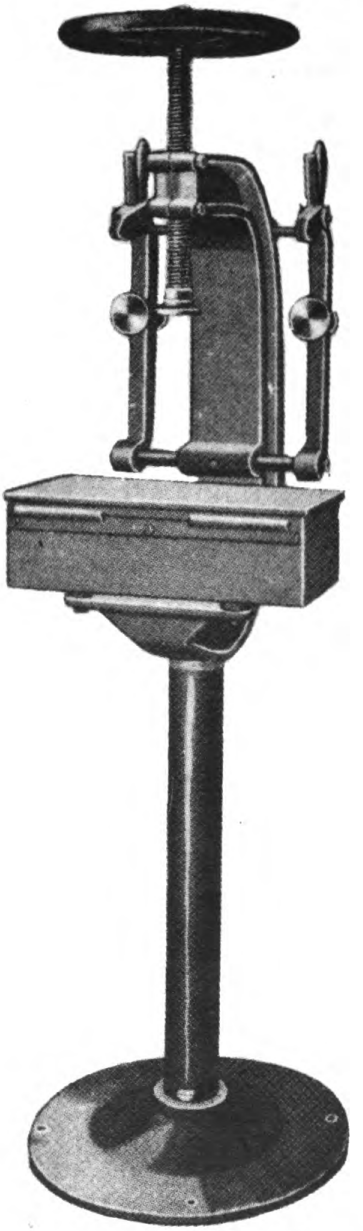
TIRE FITTING CHART
SPECIAL ARMY REPAIR EQUIPMENT

Tire Size	Tread Type	Mold No.	Mold Cavity Width	USE ACCESSORY NO.							
				Side Plates	Shell or Filler	Filler Spacer	Bead Plate	Bead Plate Spacer	Cavity Width	Tread Width Cord	Bead Inclusion
5.50x16	Hwy.	JS	7 in.	JS-75 JS-100	JS-14	None	16526	None	5¼ in.	4 $\frac{9}{16}$ in.	3¼ in.
				JS-50 JS-100	JS-14	JS-14-A	16526	16526-A	5½ in.	4 $\frac{9}{16}$ in.	3½ in.
5.50x18	Hwy.	JS	7 in.	JS-50 JS-75	JS-15	JS-15-D	18501	18501-C	5¾ in.	4 $\frac{7}{8}$ in.	3¾ in.
6.00x16	M. & S	JS	7 in.	None	JS-616-NDW Shell	None	16526	16526-B	5¾ in.	5⅛ in.	3¾ in.
6.00x16	Hwy.	JS	7 in.	JS-50 JS-100	JS-14	JS-14-A	16526	16526-A	5½ in.	4 $\frac{9}{16}$ in.	3½ in.
				JS-50 JS-75	JS-14	JS-14-B	16526	16526-B	5¾ in.	4 $\frac{13}{16}$ in.	3¾ in.
6.00x16	Combat	JS	7 in.	None	JS-616-NDW Shell	None	16526	16526-B	5¾ in.	5⅛ in.	3¾ in.
6.25x16	Hwy.	JS	7 in.	JS-50 JS-100	JS-14	JS-14-A	16526	16526-A	5½ in.	4 $\frac{9}{16}$ in.	3½ in.
				JS-50 JS-75	JS-14	JS-14-B	16526	16526-B	5¾ in.	4 $\frac{13}{16}$ in.	3¾ in.
30x5	Hwy.	JS	7 in.	JS-75 JS-100	JS-17	None	20527	None	5¼ in.	4 $\frac{9}{16}$ in.	3¾ in.
6.00x20-BB	Hwy.	JS	7 in.	JS-50 JS-75	JS-17	JS-17-B	20526	20526-B	5¾ in.	4 $\frac{13}{16}$ in.	3¼ in.
6.00x20	Combat	JS	7 in.	JS-50 JS-75	JS-17	JS-17-B	20527	20526-B	5¾ in.	4 $\frac{13}{16}$ in.	4¼ in.
32x6	Hwy.	JS	7 in.	JS-50	JS-17	JS-17-E	20526	20526-E	6½ in.	5 $\frac{9}{16}$ in.	4 in.
6.50x20-BB	Hwy.	JS	7 in.	JS-100	JS-17	JS-17-C	20526	20526-C	6 in.	5 $\frac{1}{16}$ in.	3½ in.
6.50x16	Hwy.	JS	7 in.	JS-50 JS-75	JS-14	JS-14-B	16526	16526-B	5¾ in.	4 $\frac{13}{16}$ in.	3¾ in.
				JS-100	JS-14	JS-14-C	15551	15551-B	6 in.	5 $\frac{1}{16}$ in.	3½ in.
7.00x15/16	Hwy.	JS	7 in.	JS-75	JS-16	JS-16-A+A	15551	15551-A+B	6¼ in.	5 $\frac{1}{16}$ in.	3¾ in.
				JS-50	JS-16	JS-16-C	15551	15551-D	6½ in.	5 $\frac{9}{16}$ in.	4 in.
7.00x20	M. & S.	JS	7 in.	None	JS-18-2 Wing Filler	None	20600-X	20600-B	7 in.	5¾ in.	4 in.
7.00x20	Hwy.	JS	7 in.	JS-50	JS-17	JS-17-E	20526	20526-E	6½ in.	5 $\frac{9}{16}$ in.	4 in.

7.50x16	Lug	JV	8½ in.	None	JV-756-X2 Shell	None	15551-X Use Dia.	15551-E Clamp # 2878	7¾ in.	6½ in.	4¾ in.
7.50x15/16	Hwy.	JS	7 in.	None	JS-16	JS-16-E	15551	15551-B + D	7 in.	6⅞ in.	4½ in.
7.50x20	M. & S.	JV	8½ in.	None	JV-750-X Shell	None	20801	None	8 in.	7 in.	5 in.
7.50x20	M. & S.	JW	10 in.	None	JW-750-X Shell	None	20801	None	8 in.	7 in.	5 in.
7.50x20	Hwy.	JV	8½ in.	2-JV-50	JV-750-R	None	20650	20650-B	7½ in.	5¾ in.	5 in.
7.50x20	Combat	JV	8½ in.	None	JV-750-X Shell	None	20800	None	8 in.	7 in.	5½ in.
7.50x16	Combat	JV	8½ in.	None	JV-756-X2 Shell	None	15551-X Use Dia.	15551-E Clamp # 2878	7¾ in.	6½ in.	4¾ in.
8.25x16	Combat										
8.25x20	M. & S.	JV	8½ in.	None	JV-850-X	None	20800	20800-A	8½ in.	7¼ in.	6 in.
8.25x20	Hwy.	JV	8½ in.	JV-50	JV-820-R	None	20800	None	8 in.	6⅜ in.	5½ in.
8.25x20	Combat	JV	8½ in.	None	JV-850-X	None	20801	20800-A	8½ in.	7¼ in.	5½ in.
9.00x16	M. & S.	JW	10 in.	None	JW-906 Shell	None	16900	None	9 in.	7½ in.	5½ in.
9.00x16	Combat	JW	10 in.	None	JW-906 Shell	None	16900	None	9 in.	7½ in.	5½ in.
9.00x20	M. & S.	JW	10 in.	JW-50	JW-1050-X2	None	20951	None	9½ in.	7¾ in.	6 in.
9.00x20	M. & S.	DZ	N 4355 Spac. 10½ in. + ¼ in. = 10¾ in.	None	DZ-1000-X2 Shell	None	20951	None	9½ in.	7¾ in.	6 in.
9.00x20	Hwy.	JW	10 in.	2-JW-50	JW-900-R	None	20900	None	9 in.	7⅛ in.	6 in.
9.00x20	Combat	JW	10 in.	JW-50	JW-1050-X2	None	20951	None	9½ in.	7¾ in.	6 in.
10.00x20 22	M. & S.	DZ	10½ in.	None	DZ-10522-X	None	20952	20950-B	10½ in.	9⅛ in.	6½ in.
10.00x20 22	Hwy.	JW	10 in.	JW-50	JW-970-R	None	20950	None	9½ in.	7⅜ in.	6½ in.
10.00x22	Combat	DZ	10½ in.	None	DZ-10522-X	None	20952	20950-B	10½ in.	9⅛ in.	6½ in.
11.00x20	Hwy.	JW	10 in.	None	JW-1050	None	20950	20950-A	10 in.	8⅛ in.	7 in.
11.00x20	Combat	DZ	10½ in.	None	DZ-10522-X	None	20950	20950-B	10½ in.	9⅛ in.	7½ in.
12.00x20	M. & S.	DZ	10½ in. + ¾ in. = 11¼ in.	None	DZ-11220-X	None	20112-2	None	11¼ in.	10 in.	8 in.
12.00x20	Combat	DZ	10½ in. + ¾ in. = 11¼ in.	None	DZ-11220-X	None	20112-2	None	11¼ in.	10 in.	8 in.
13.00x24	M. & S.	DZ	10½ in. + 2¼ in. = 12¾ in.	None	DZ-12724-X	None	24112-3	24112-A	12¾ in.	11⅜ in.	9¼ in.
14.00x20	M. & S.	DZ	10½ in. + ¾ in. + 2¼ in. = 13½ in.	None	DZ-13520-X	None	20135-2	None	13½ in.	12¼ in.	10 in.
14.00x20	Combat	DZ	10½ in. + ¾ in. + 2¼ in. = 13½ in.	None	DZ-13520-X	None	20135	None	13½ in.	12¼ in.	8¾ in.
14.00x24	M. & S.	DZ	10½ in. + ¾ in. + 2¼ in. = 13½ in.	None	DZ-13524-X	None	24135-2	None	13½ in.	12¼ in.	10 in.
14.00x24	Combat	DZ	10½ in. + ¾ in. + 2¼ in. = 13½ in.	None	DZ-13524-X	None	24135	None	13½ in.	12¼ in.	8¾ in.

Figure 27 — Recommended Parts Components

RA PD 39422



RA PD 39423

Figure 28 — Spot Press

c. The spot press is illustrated in figure 28. When using it for tubes, the center screw clamp is screwed out of the way and the spring tension hand clamping bars are used. Do not use excessive pressure. The pressure is adjustable by the screw in the center of the clamp.

d. For spot repair work, the contour block to fit the shape of the tire is laid on the plate, and the tire, with a sand bag fitted inside,

is supported on the contour block with a chain or block at its other side. Pressure is applied by means of the center clamp screw.

29. PRECISION BUFFER — OPERATING INSTRUCTIONS.

a. A set of four wheels of different dimensions is furnished with the machine and it is necessary that all passenger tires be inflated before buffing until they are rigid, causing each tire to be turned out perfectly round. The tire slides on to the wheel without the use of tools. The bead of the tire at one point is first inserted into the bottom of the drop center wheel with the hands and since the wheel is undersized, the tire can be easily pushed on the wheel with the hands. Tires are more easily mounted when the wheel is in operating position on the machine; wheel is fitted with two valve openings for the tube, so that the valve can be inserted regardless of which side of wheel is in the top position.

b. The valve core should be removed from the tube, so that it will inflate and deflate more rapidly. An ordinary valve cap should be used to retain the air while buffing.

c. A 20-in. wheel for buffing all sizes of truck tires of 20-in. inside diameter is included as standard equipment in addition to three passenger wheels, sizes 15-in., 16-in., and 17-in. No air is required for buffing truck tires. This wheel has a straight flat rim with no provision for a valve opening.

d. To mount truck tires, place truck wheel in position on machine and then put tire on it, using the bead clamp ring to clamp the beads of the tire in a secure position. The aluminum wheel retaining plate used on the passenger wheel is not used when mounting truck tires. When buffing the large sizes — 20-in. tires — the two beads of the tires are sometimes wider than the rim of the wheel, and in such cases, it is necessary to turn the clamp ring over in order to get the retaining nut started.

e. The wheel support assembly is mounted at an angle to the moving rasp and as the tire is moved into the rasp with the horizontal screw, it is automatically turned, due to the pulling action of the rasp. The speed of rotation of the tire is adjusted by the adjustment bracket just underneath and to the left of the wheel. Adjustment should be made so that the tire turns fast enough to prevent burning but not so fast that the buffing job cannot be observed as the operator proceeds.

f. In buffing, the rasp should be allowed to touch the outer edge of the tire first and then buff to the center of the tire until buffed half-way across. Then turn wheel over and buff other half of the tire from the edge to the center in a similar manner. In buffing a truck tire, turn only the tire over and not the wheel. The operator should feed the tire into the rasp so that a rough surface is produced and

speedy results obtained. Average buffing time for any size truck tire is 4 to 5 minutes.

g. The rasp assembly used as standard equipment consists of a steel band filled with case-hardened tacks, and two rasp hubs. This steel band is tempered and lasts indefinitely, it being necessary only to replace the tacks in order to have a new cutting surface.

(1) To remove the rasp band for replacement of tacks, take out the bolt holding together the two halves of the rasp guard and blower inlet. The outer half, if then turned back on its hinges, permits removal of the rasp hub retaining nut which has a LEFT hand screw. The hub is then easily slipped off the motor shaft. Do NOT try to separate the hubs by using a screw driver between the edge of the hub and the rasp band; this sometimes results in a broken hub edge. Holes are provided in each hub for use of a punch in order to remove from the rasp band.

(2) Tacks are replaced by driving out with a hammer and then retacking from the inside. When inserting new tacks in the band, a piece of soft wood should be used underneath, so that the points of the tacks will not be damaged and a solid base is obtained for hammering. This operation can be performed while holding the band in one hand.

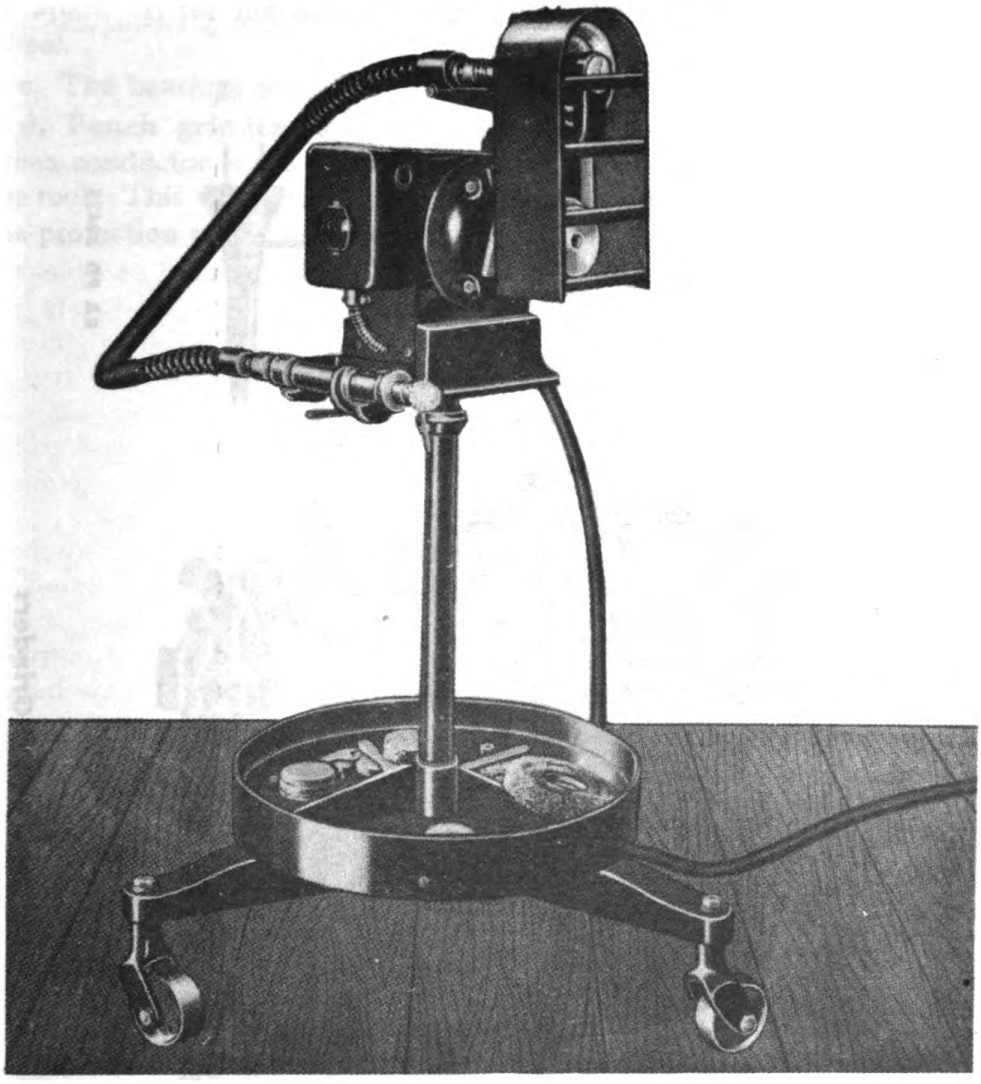
h. Lubricating oil should be used every ten days of service in the oil cup provided on the fan shaft, and instructions attached to the motor should be followed as to its care. The control screws should be kept clean and oiled. The air hose provides a desirable means of cleaning the screws, which can be done in only a few seconds.

30. THE FLEXIBLE SHAFT BUFFER.

The flexible shaft buffer, figure 29, is bolted to the floor, when in transit in front of the pedestal buffer. When unbolted it is mounted on caster. No attention is required in service.

a. When new or when a new shaft is installed, it is essential that the direction of rotation be established so as to wind the core in a tightening direction. The end pieces must be kept tight. New shafts should have a paper collar or spacer at the point where the shaft housing fastens to the motor housing. After several months the shaft will have stretched enough to permit the spacer to be removed. Do not force the shaft housing into the motor connection tightly. If it has not stretched enough to butt against the shoulder, leave space when tightening the lock bolt.

b. When operating the brush, do not bear down hard. This bends the wires so that the tips do not touch the work, thereby slowing the cutting speed. The brush sections should be removed and turned around daily. Burrs are provided for roughing out, and the brush for finishing. The speed is adjustable by moving the belt as follows: First remove the guard. Then loosen the set screw and slide the



RA PD 39424

Figure 29 — Flexible Shaft Buffer

pulleys together. After moving the belt adjust it to a moderate tension, make sure it is in line with the pulleys, and tighten set screw.

31 BENCH GRINDERS.

a. Bench grinders, figure 30, are equipped with one grinding wheel and one wire brush. The labels are shock absorbing blotters and should always be between the retaining washers. One end of the grinder shaft is a left-hand nut so that the tendency is to tighten. Remove the nuts by holding the wheel or brush and turning the nut in the direction the shaft rotates.

b. After installing a new wheel or brush, always stand to one side until it has run at full speed, in order to escape injury should it

RA PD 39425

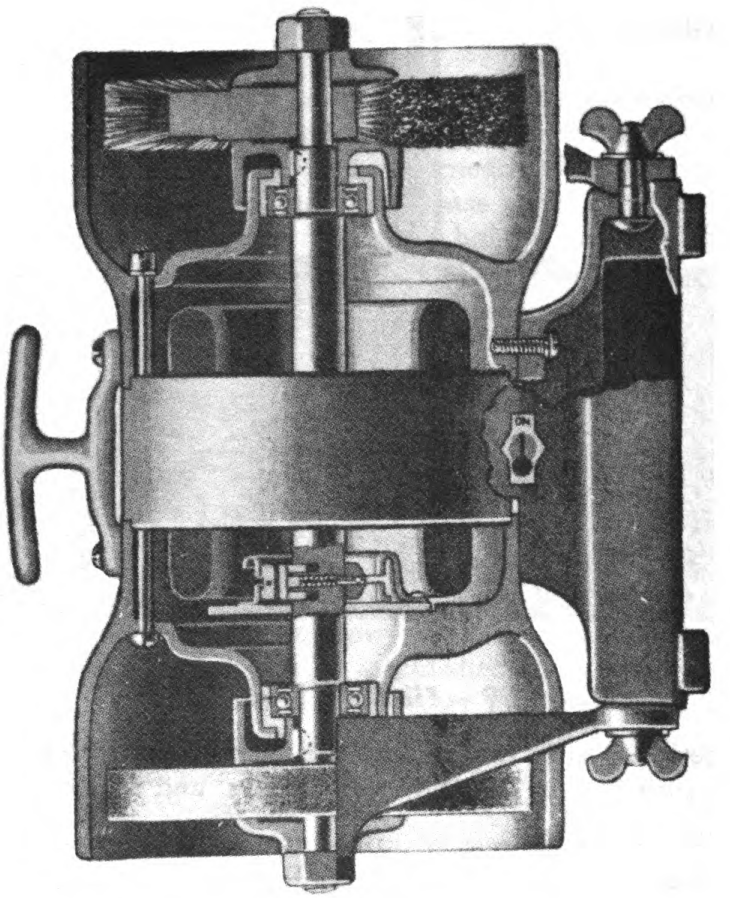


Figure 30 — Bench Grinders

fly apart. If the machine vibrates it may be necessary to dress the wheel.

c. The bearings are sealed and require no attention.

d. Bench grinders are fitted with 3 conductor cables. The green conductor is the ground wire and is connected to the frame of the tool. This wire should be permanently connected to a ground for the protection of the operator if the tool should develop a short.

ORDNANCE MAINTENANCE

CHAPTER 2

PROCESSING OF TIRES AND TUBES

Section I

STANDARD TIRE REPAIR

INSTRUCTIONS FOR CLASSIFYING AND RECONDITIONING TIRES

1. All tires returned to Collection Point will be inspected and classified as follows:

a. Suitable for military use.

(1) Used tires not requiring repairing or retreading.

(2) Tires in need of treading which do not require more than two section repairs or two inside repairs.

(3) Tires in need of repairs which do not require more than two section repairs or three inside repairs.

(4) Tires to be treaded or repaired should not have injuries larger than the following:

(a) Two inches in size up to and including 6.00; 3 inches in 6.50, 7.00 and 7.50; 4 inches in larger sizes.

(b) Extending to within 1½ inches of base of the bead in sizes up to and including 6.00; or 2 inches of the base of the bead of larger sizes.

(c) Exceptions to paragraph (4) *(a)* and (4) *(b)* above may be made when in the opinion of the inspector the location of the injury and the condition of the tire make it practicable.

(d) No limitation on number of nail holes or injuries requiring spot repairs.

(5) Tires to be treaded must be worn smooth in the center to the extent that treading is necessary and must not be worn through more than one ply all around.

b. Class C: Not suitable for further military use and segregated as follows:

(1) C-1; tires having abnormal breaks or wear.

(2) C-2; tires total scrap.

32. INSPECTION.

a. General. A careful and complete inspection is essential to the success of the repair operation. At the time of inspection it is necessary to determine whether or not the material expended for the repair will be justified by the additional service to be derived. To make that determination, it is necessary to find all the injuries and to decide the size and type of repair required. The information given above, instructions for classifying and reconditioning tires, may be used as a guide for the classification and reconditioning tires.

When a tire is processed it should be dry and clean. A tire spreader is provided to facilitate this inspection. Before making a detailed inspection, a quick initial inspection should be made to detect obvious injuries which may make the tire unsuitable for repair.

b. All cuts in the outside tread and in the sidewalls should be investigated by probing to the bottom. All foreign matter should be removed from the cuts. With a yellow crayon, circle each injury to be repaired. Note any peculiarities in the wear pattern; also note the number, size, and type of injuries. The area around any injury should be tapped. A hollow sound indicates separation that must be carefully investigated.

c. Gouges or cuts into the body should be noted since they cause weakness. If the damage has been caused by a nail puncture, an "X" should be marked with crayon on the outside, unless the tire is to be retreaded.

d. Nail holes with no visible damages to the outside may be evidenced by darkened spots on the inside. *Broken cords or soft spots* may indicate that the tire has been subjected to a heavy impact load, such as could be caused by running over a sharp stone. This condition would result in broken or stretched cords inside the carcass, and possible tread separation. In such cases the tire should be tapped all the way across on the outside and inside, with particular attention to the shoulder area. Soft spots and separated areas should then be cut back far enough to determine the actual extent of the injury. The cut places should be circled. Broken cords all the way around the circumference are not ordinarily repairable. Bulges and scuffed areas due to boots are not usually repairable. Tread separation may be repaired, if localized within a small area. If the separation is general, the tread may be removed and the tire retreaded.

e. Radial cracks in the tread and checked sidewalls are conditions which indicate failures due to faulty construction or to overage. Radial cracks throughout the sidewalls cannot economically be repaired. If the cracks do not extend into the cord, the tire may be retreaded. Cracks in the tread are often first indicated by a dark line on the band ply. These cracks indicate overloading or underinflation and consequent general breakdown. This condition is not repairable.

Checked sidewalls due to age are generally accompanied by a dry, hard, dead appearance and feel. When spread, these tires may crack. This condition is usually the result of long storage without adequate protection; or the result of repeated recapping. Tires of this type are not suitable for military service.

After all injuries are marked, a tag may be attached to provide space for the initials of the inspector and of those who will later work on the tire. Repairs as necessary may then be made.

33. REPAIRING.

The purposes of a repair are to restore adequate strength and to seal the cords against moisture. The tables included in this section are for the purpose of denoting how much reinforcement is required for a specified injury. Repair procedure is discussed here in three parts: (a) inside only, (b) outside only, and (c) all the way through.

a. Inside repairs. Repairs of this nature are necessitated by impacts that break cords in the inside ply without cutting the outer material.

The flow of work through the shop may prevent repairing on the spreader. The tire may, in that case, be held open by wooden blocks cut to appropriate lengths. Do not use blocks made from scrap pieces so small or sharp that they will injure the bead.

First, the injury should be skived or trimmed with a knife to remove all broken, frayed, water-soaked, and bruised cords, figure 32. Next, the edge should be bevelled at an angle of about 45 degrees. *Do not cut away any more material than necessary.* There must be no sharp or square corners. The skive may be roughened with a wire brush or bur rasp of appropriate shape, figure 33.

Patches will be available either as semi-cured ready-built or may be built up from cord fabric. (Ready-built patches are sometimes called semi-cured or pre-built). The table of minimum recommended number of plies and minimum sizes for ready-built patches (Table A), at the end of this section, indicates the number of plies, and the approximate minimum size patches. Repairs to injuries of very large size, or of unusual shapes, or in unusual locations, may be superior if they are built in from cord fabric.

However, if a ready-built patch that fits the injury is available, use it. The size of built-in patches made from cord fabric is deter-

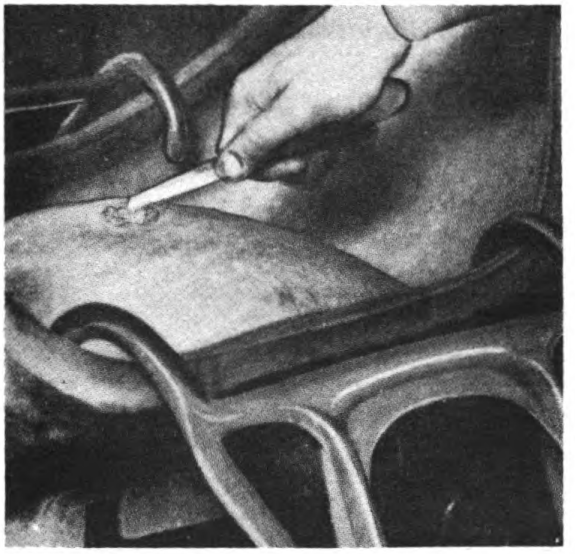


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Figure 32 — Injury Being Skived

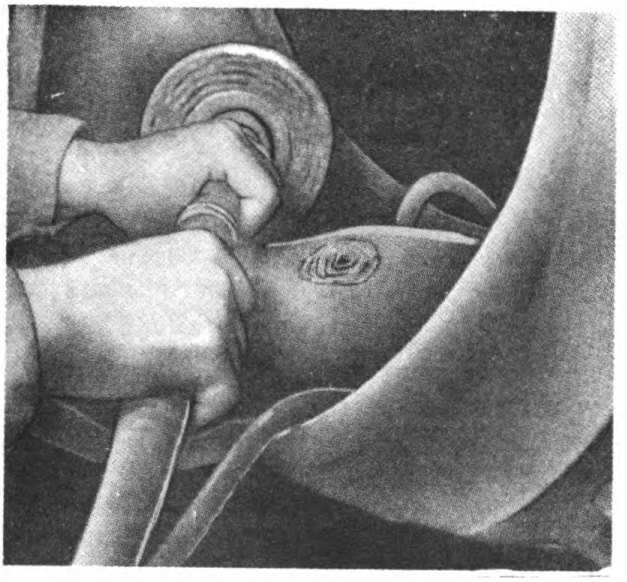

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Figure 33 — Skive Roughened With Wire Brush

mined as follows:

(1) Procedure for determining size of built-in patch:

(a) Measure the size of the injury *across* the cords of the inside ply. Add one inch to this, and the total is the width of the first ply of the patch.

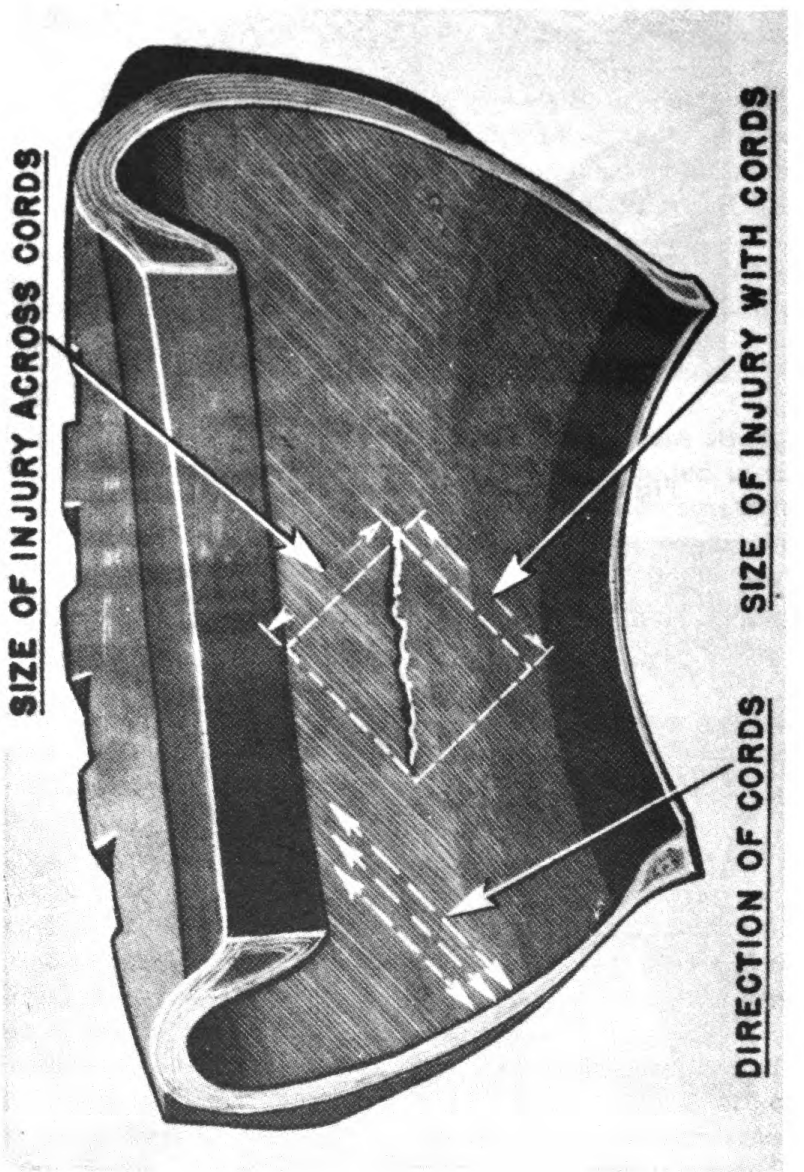


Figure 34 — Measuring Size of Injury With Cords

TIRE REPAIR AND RETREAD

(b) Measure the size of the injury *with* the cords of the inside ply (fig. 34). Add one inch to this, and the total is the width of the second ply of the patch.

(c) Using Table A (see end of this section), determine the number of plies to be built in.

(d) Make a table as follows:

ODD PLIES			EVEN PLIES		
	Width	Length		Width	Length
1.	.....	.....	2.	.....	.....
3.	.....	.....	4.	.....	.....
5.	.....	.....	6.	.....	.....
7.	.....	.....	8.	.....	.....
9.	.....	.....	10.	.....	.....

(e) Opposite 1-ply write the width determined in *(a)* above. Then write the widths of each succeeding odd ply by increasing in steps of 1-in.

(f) Add 2-in. to the width of the last odd ply to find the length of the 2-ply.

(g) Add 2-in. to the width of the last even ply to find the length of the 1-ply.

(h) Increase the lengths in steps of 2-in.

Example of procedure for determining size. Maximum length of injury 2-in., 4-ply tire.

Size across cords (see illustration): 1 in.

Size with cords (see illustration): 1½ in.

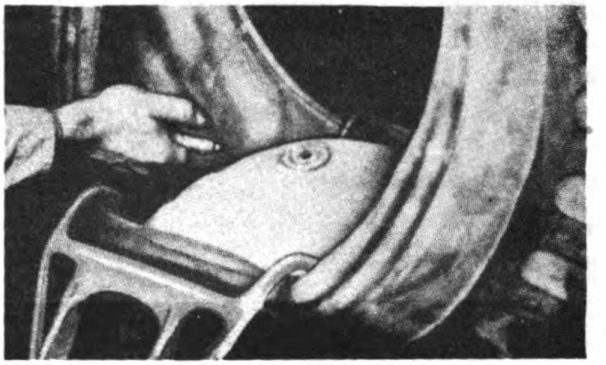
Table A shows that only 4 plies are required.

ODD PLIES			EVEN PLIES		
	Width	Length		Width	Length
1.	2-in.	5½-in.	2.	2½-in.	5-in.
3.	3-in.	7½-in.	4.	3½-in.	7-in.

After selecting the patch size, use a flexible-shaft wire brush to buff the inside ply at an equal distance around the skived injury. Use the brush until the buffed area is about an inch wider all around than the patch. Do not buff across the cords; buff parallel to them as much as possible to avoid loosening the cords. All dirt and paint must be removed. Finally, blow out the dust from all around the inside with an air hose, as shown in figure 35.

The tire must be dry. If it is not, hang the tire in a clean, warm place until it is dry. Do not touch the buffed area.

After buffing, apply a liberal coat of vulcanizing cement to the buffed area, brushing and stippling it in thoroughly so that the whole surface is covered smoothly, figure 36. Allow to dry slightly. Then apply a second coat. Allow the cement to dry thoroughly. The



RA PD 39429

Figure 35 — Dust Blown From Inside With Air Hose

RA PD 39430

Figure 36 — Vulcanizing Cement Being Applied to Buffed Area

cement is dry when there is no longer any odor of rubber solvent and when a piece of cushion gum pressed on, tears on removal. Do not touch the cement. If the cement has dried for so long that tackiness has been lost, apply a thin coat of cement and dry for one-half hour. Another procedure is to moisten the cement with solvent.

The cavity is then filled with cushion gum, figure 37. This is applied most easily in strips ½ inch wide. Pull off the holland a few inches ahead of the part that is being stitched. If the injury is of considerable depth, stitch the stock around the edge first, then stitch the stock into the cavity, building it up even with the inside ply, figure 38. Then apply one layer extending 1 inch around the edge.

(2) Built-up patches are made as follows:

(a) Cut the cord fabric in accordance with the sizes determined.

(b) Remove the holland from the first ply, and center it over the injury, with the cords running in the same direction as the cords in the inside ply of the tire.

NOTE: Do not open the tire any more than necessary.

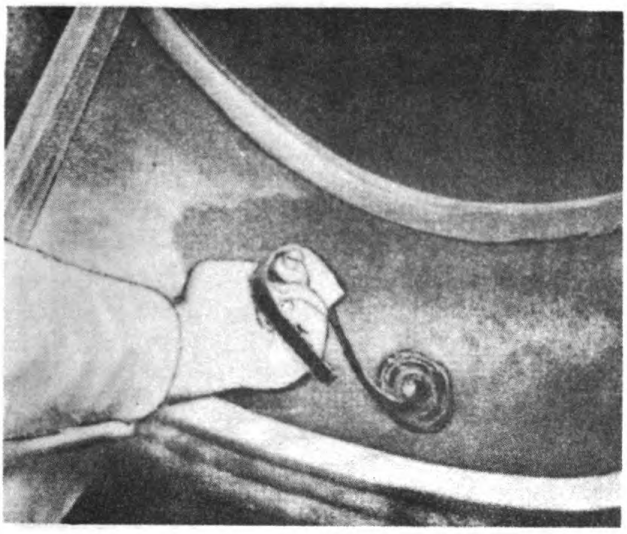


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Figure 37 — Cavity Being Filled With Cushion Gum

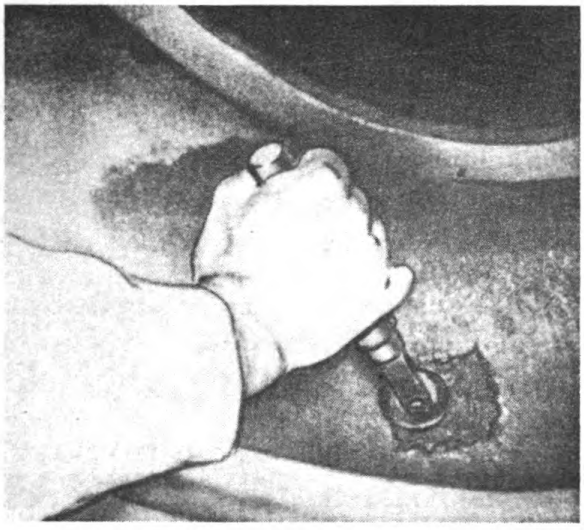

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Figure 38 — Building Up Stock Even With Inside Ply

(c) Stitch the ends down, leaving the ply slightly bridged over the injury, figure 39.

(d) Start in the middle and work evenly out to the sides. This will place the cords under a slight tension.

(e) Prick any bubbles of trapped air and stitch down tight.

(f) The second ply and each succeeding ply is similarly built in with the cords of the ply at right angles to the cords of the ply before it.

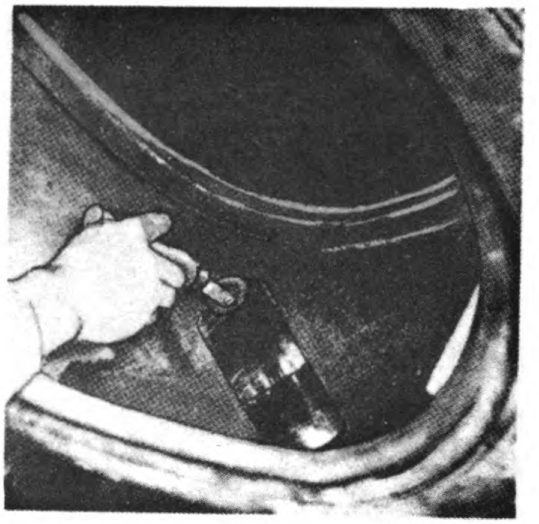

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Figure 39 — Stitching Ends of Ply

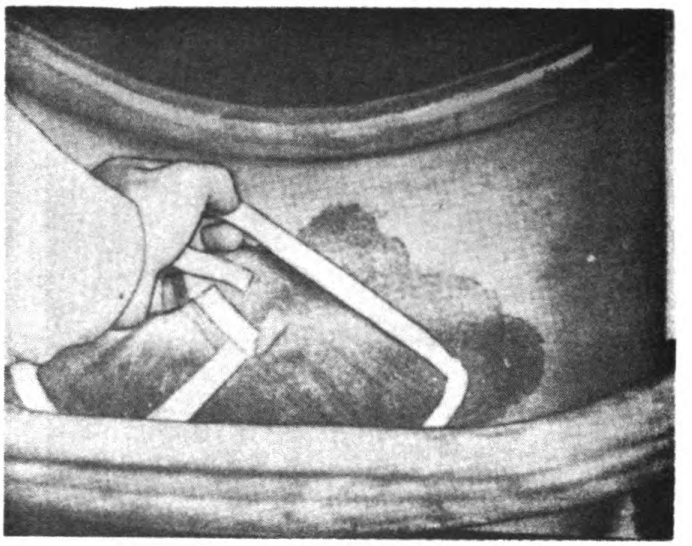

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Figure 40 — Stripping With Cushion Gum

(g) Complete the finished patch by centering a double strip of cushion gum (about ½ in. wide) across the ends. Use a single strip to cover the sides, figure 40.

The sizes determined according to the method in paragraph 2 (1) would frequently extend the patch above the bead, in sidewall injury cases. If this occurs the patch should be built in and stitched down, and then the excess must be cut off and beveled down to prevent excess material at bead edge, and to prevent increasing the bead width, figure 41.

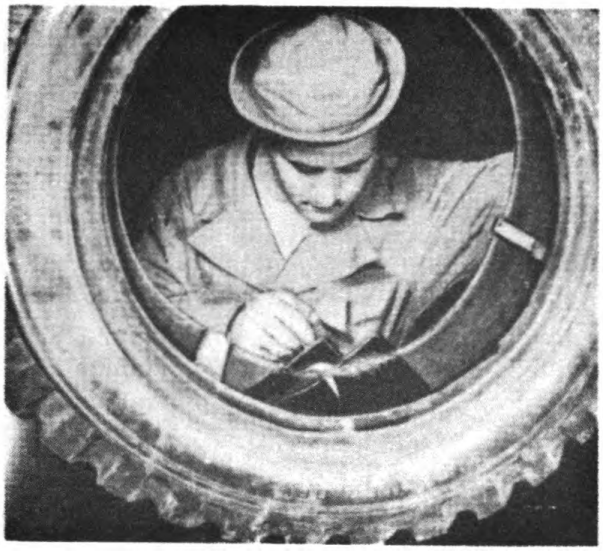

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Figure 41 — Cutting Off Excess Material

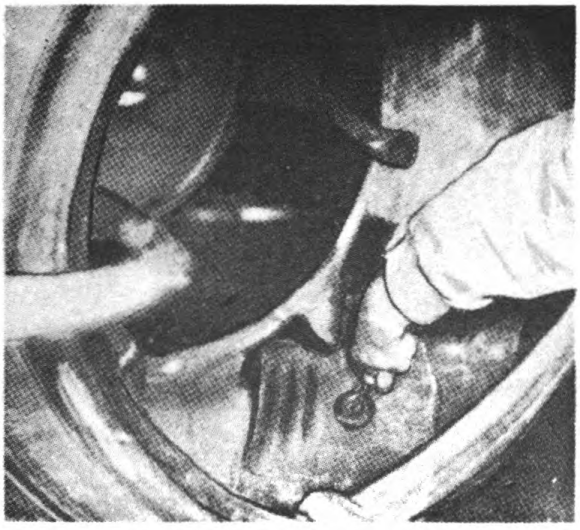

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Figure 42 — Stitching

(3) Ready-built patches are applied as follows:

(a) Remove the holland.

(b) Determine the direction of the first ply.

(c) Bend the patch so that the middle will contact the tire first. Place patch over the hole with the cords in the first ply running in the same direction as the cords in the inside ply of the tire.

(d) Stitch firmly starting in the middle.

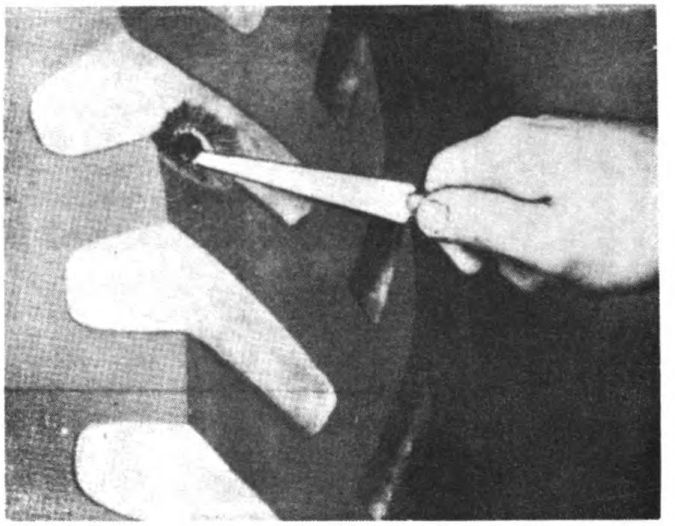

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Figure 43 — Injury Being Skived

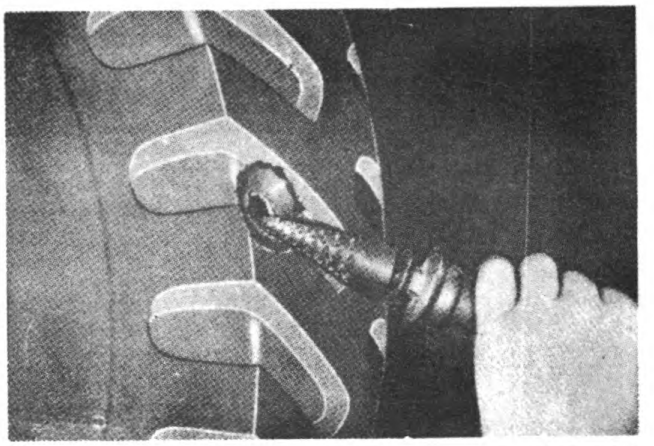

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Figure 44 — Injury Being Roughened

(e) Prick any air bubbles and stitch tight. Patches built from cord fabric may be made on a table or a form, instead of in the tire. The larger sizes should be built on a form and may be built in two parts; each of an even number of plies. Generally, a convex form should be used, in which case the patch must be built upside down. The last or largest ply must be laid down first, protected side up, and the rest built on top in reverse of the normal order.

b. Outside repairs. Preparation is made in similar fashion to that described for inside repairs. Skive, roughen and cement the injury as shown in figures 43, 44 and 45. Then build in the repair with cushion gum covering the exposed cord fabric up to the lower level

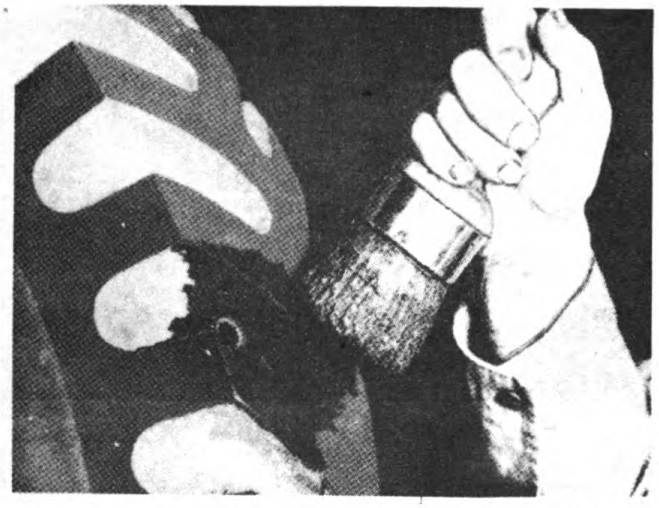

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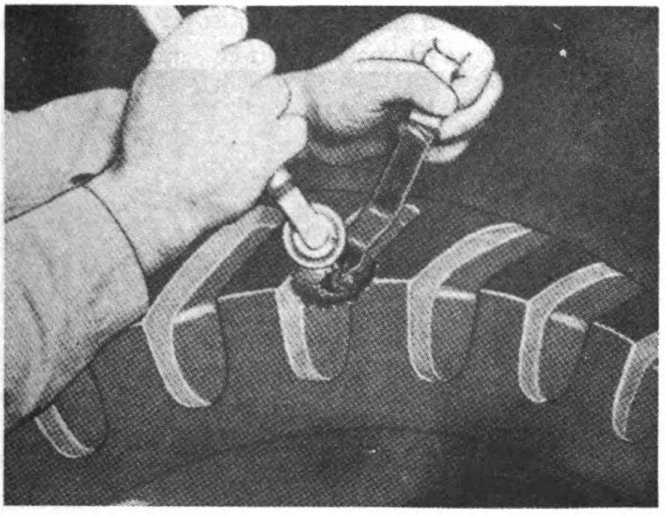
Figure 45 — Injury Being Cemented



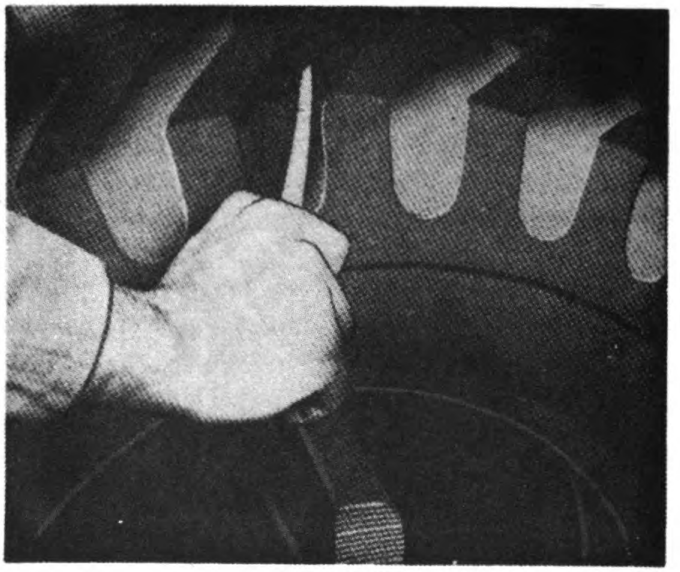
RA PD 39440

Figure 46 — Layer of Cushion Gum Applied Over Skive

of the tread. Apply a layer of cushion over the whole skive, figure 46, then fill the cavity to slightly above the top of the tread stock and trim off any excess, figure 47.

When cords are injured, it is usually necessary to apply a reinforcement patch to the inside. Table A should be used as a guide. The area of injury which must be reinforced should be determined by the extent of the damage to the top ply.

If the tread design is such that pressure cannot be applied to the entire plug, the tread should be blocked or filled with a thick paste



RA PD 39441

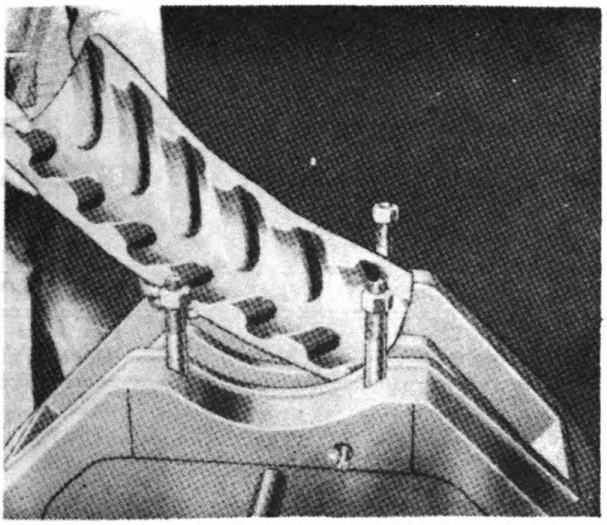
Figure 47 — Trimming Excess

RA PD 39442

Figure 48 — Blocking Tread With Soapstone

of soapstone and water, figure 48, or buffing dust. If there is an appreciable volume of such repairs, rubber matrix shown in figure 49 may be made.

c. Major injury and section repairs. Cuts all the way through must be prepared from both sides. The first skive should be made from the side of the greater damage. The second skive should be made so that it joins the first skive at the top or outer body ply. The breaker (extra plies) and cushion will be in the outer cavity. Side-



RA PD 39443

Figure 49 — Rubber Matrix

wall skives should also be made from the inside and outside but they should meet at the center. Build the repair on the inside first, so that there will be enough support to tighten the outer plug. Both inside and outside repairs are made as described in a and b above.

34. CURING.

a. Curing bags for all sizes will be of the combination air and steam type, except those for motorcycle tires, which will be air type. After placing bag in the tire, and the tire in the mold, connect the bag to the air or steam line according to the chart. The curing schedule should be consulted to get the curing times, pressures, and temperatures.

Bags must be used according to the sizes marked on them. The bag must be centered over the repair in order to get uniform pressure, and the bag must be centered in the mold. Overhanging ends will swell, permanently injuring both bag and tire.

b. Sidewall spot repairs may be cured in the spotter using the contour block and sand bag described in paragraph 28.

35. SECTIONAL REPAIR MOLDS.

The table in paragraph 28, gives the mold and matrix combination to be used with each of the tire sizes and tread designs listed. Due to variations in actual tread widths and contours, smaller tires will fit loosely in the mold. In these cases, the shoulders must be padded with rubber strips, or with a thick paste of soapstone and water. Occasionally, strips or padding may be required at other points. Tires must fit snugly in the mold at all places, otherwise a bulge will be formed. If desired, strips for padding may be permanently molded

TABLE A

TABLE OF MINIMUM RECOMMENDED NUMBER OF PLIES AND MINIMUM SIZES FOR READY-BUILT PATCHES

4 PLY TIRES

¼ in. to ½ in. Injury			Over ½ in. to 3 in. Injury	
Plies Injured	Min. Plies in Patch	Min. Size	Min. Plies in Patch	Min. Size
1	None		None	
2	2	2½	2	5
3	2	5	2	7
4	2	7	4	9

6 PLY TIRES

	¼ in. to 1 in. Injury		1 in. to 3 in. Injury		Over 3 in. to 4 in. Injury	
Plies Injured	Min. Plies in Patch	Min. Size	Min. Plies in Patch	Min. Size	Min. Plies in Patch	Min. Size
2	None		None		2	7
3	2	5	2	7	2	9
4	2	7	4	9	4	10
6	4	7	4	10	4	12

8 PLY TIRES

3	None		None		2	7
4	2	5	2	9	4	10
6	4	7	4	9	4	12
8	4	10	6	12	6	14

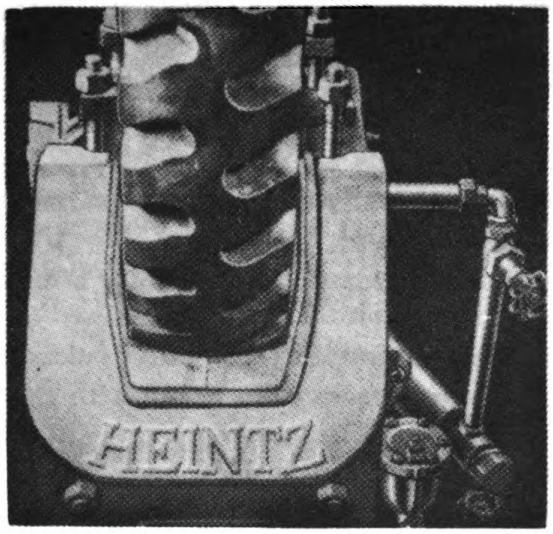
10 PLY TIRES

4	2	5	2	7	2	9
6	4	7	4	10	4	12
8	4	9	6	12	6	14
10	6	12	8	14	8	16

12 PLY TIRES

4	None		2	7	2	9
6	4	7	4	10	4	12
8	4	9	6	12	6	14
10	6	12	8	14	8	16
12	8	14	10	16	10	18

NOTE: Injuries larger than the maximums shown are to be repaired with patches of a size determined by the procedure in paragraph 2 (1).



RA PD 39444

Figure 50 — Tire in Sectional Mold

and re-used. Figure 50 shows tire properly inserted and locked in sectional mold.

The mold must be at the proper temperature as noted in the curing schedule. Insert the bag and fit the tire into the mold; then place the bead plates in the cavity and put the mold cross clamps in position. Tighten the clamps only enough to press the bead plates in position. The cross clamp may then be loosened ¼ turn. Next, inflate the bag.

After the tire has been completely cured, release the pressure in the bag, unclamp the mold, and remove the tire. Use a spreader, if necessary, to remove the bag. *Do not pull the bag out by the hose.* Then paint the bag.

If the tread was blocked, remove the blocking while the tire is hot, being careful not to strain the repair plug. Any overflow should be cut out after the tire has cooled to restore the tread design. Inspect for wavy cords. Dust repairs with soapstone to prevent tube sticking.

Section II

REPAIR INSTRUCTIONS FOR COMBAT TIRES

ORDNANCE MAINTENANCE

The following special instructions outline the procedure to be followed in repairing combat tires. Complete instructions for specific operations are contained in Section I of this chapter.

36. SMALL AND MEDIUM INJURIES.

These injuries require no inside reinforcement when cured.

a. Clean dirt out of injury.

b. Clean liner surface around the injury for a distance of at least 3 inches (slightly larger than the patch to be used).

c. Cement the cleaned liner surface with a vulcanizing cement.

d. Apply a small 2-ply ready-built patch with the uncured facing centered over the injury.

e. Fill the injury with repair cushion gum.

f. Cure the outside surface of the cushion gum on a spot press, in open steam, or in a sectional mold.

NOTE: On this size repair, it is only necessary to get a surface cure to seal the filled-in hole against dirt and moisture.

37. LARGE INJURIES THROUGH TIRE AND LINER (OVER 1-IN.).

This injury requires removal of a portion of the liner and inside reinforcement.

a. Select the proper size patch for proper reinforcement of the injury. Use patches containing plies as follows:

For 1-in. to 2-in. injuries — 40 to 60% of plies injured.

For over 2-in. injuries — 50 to 75% of plies injured.

b. Center the patch on the liner over the injury and outline with ½-in. margin on all sides.

c. Remove the liner by cutting or buffing from the entire outlined area, making a 45 degree angle skive at the border.

d. Cut out the injury through the tire and double bevel from inside and outside.

e. Buff the inside and outside skives and rasp the tread skive in the conventional manner. If a cured patch is used, buff the top or cured side.

f. Spread vulcanizing cement on the buffed tire area and on the buffed cured patch.

g. Apply patch inside. Replace liner by building up with cushion gum until flush with original inside tire contour.

h. Fill in the cord body skive with cushion gum and the tread skive with tread repair stock.

i. Cure in sectional mold or in open steam.

38. CURING.

a. Cures for combat tires are, as noted in the schedule, longer than for the conventional tread tires of the same size because of the additional liner thickness.

b. In some cases prevalent sectional bag sizes and shapes are not perfect fits for combat tires because of the liner contours. In case the bag base is narrow or low, pad up with tread repair stock to prevent extreme distortion.

Section III

RETREADING

39. PRIMARY INSPECTION.

After inspection, all tires requiring reinforcements should be repaired according to regular procedure. After the tire has been repaired, or has been inspected and found not to need repair, it may be classified or its classification may be rechecked.

It is possible that the repairs will be larger than originally expected and that the repaired tire will have become unsuitable for its original classification. During the inspection after repair, the inspector should be careful to note any outside bulges, waves in cords, or looseness at the edge of repairs.

Retreadable tires may contain small cuts or general separation, analysis of which is time-consuming and difficult. In such cases it is desirable to have the tire buffed before fixing the classification.

40. BUFFING.

Buff tread and shoulder area sufficiently to remove all tread design and provide a clean roughened surface, figure 51. The contour of the matrices should be followed by manipulation of the controls to result in a high shoulder. The crown width should be ½-in. to ¾-in. less than the crown width of the matrix to be used.

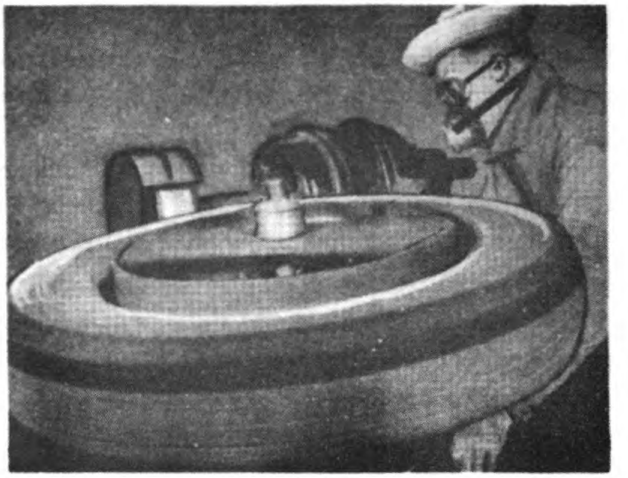


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Figure 51 — Buffing Shoulder

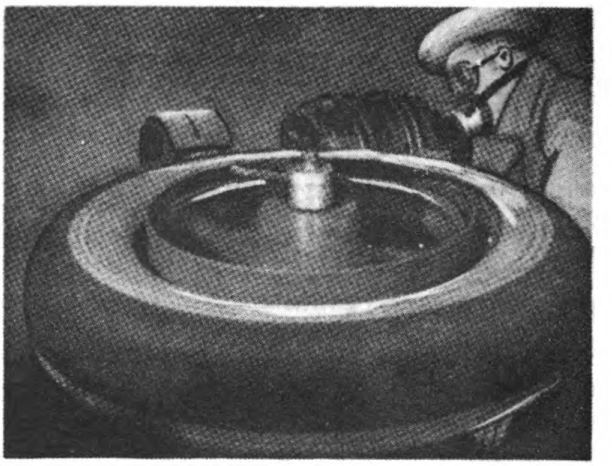

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Figure 52 — Buffing the Crown

41. SECONDARY INSPECTION.

After buffing, all dust should be brushed or blown away with an air hose, and the tire inspected again for injuries, particularly nail holes and imbedded foreign matter. All injuries should be cleaned and roughened. A small file is a suitable tool for this purpose. If there is tread separation which is not repairable, all the old tread must be removed. If the breaker strip is damaged or loose, it should be removed. All loose cord ends should be trimmed, figure 53. Nail holes should be cleaned with solvent and plugged with cushion gum. Any injuries requiring reinforcement should be repaired before proceeding.

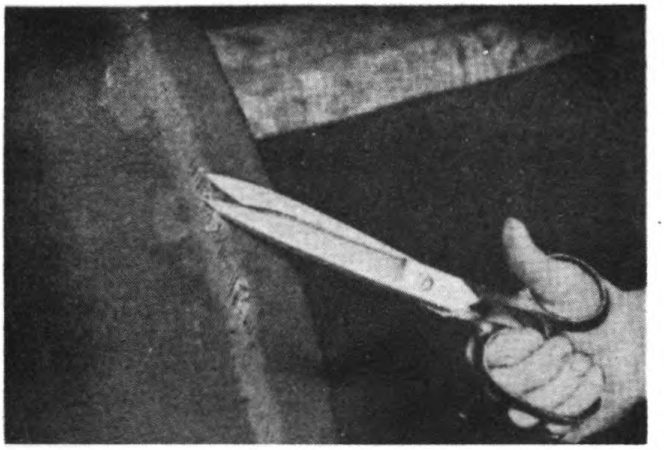

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Figure 53 — Trimming Loose Cord Ends

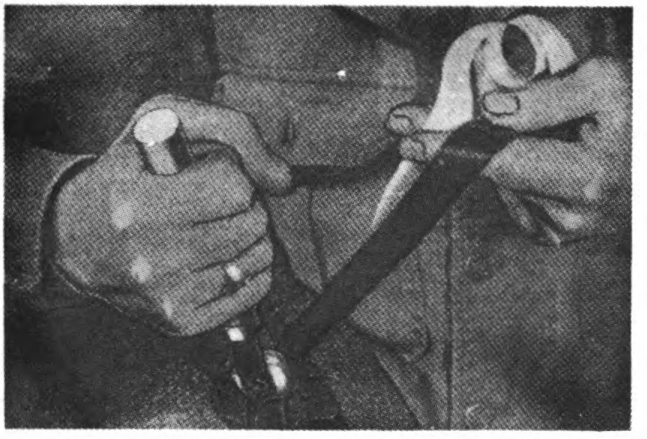

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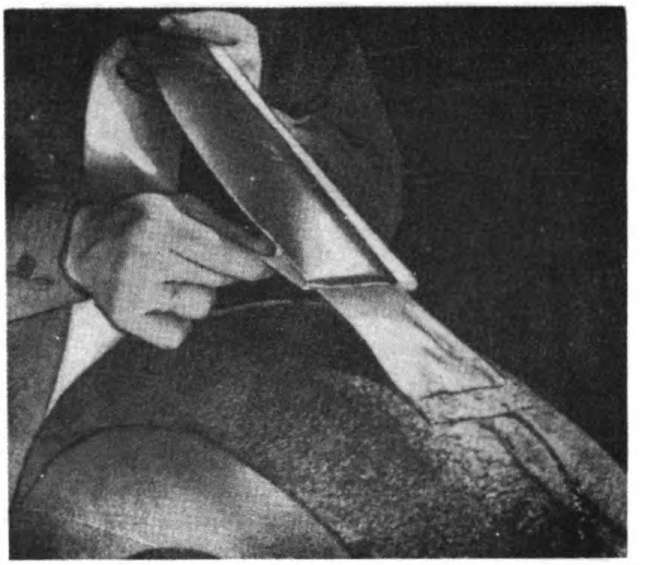
Figure 54 — Building Up Low Spots

42. CEMENTING AND DRYING.

For the cement to dry thoroughly, the tire must be clean and dry. Two coats of cement should be thoroughly stippled over the entire buffed area. Allow the cement to dry. The cement is dry when there is no longer odor of rubber solvent and when a piece of cushion gum pressed on, tears on removal. Do not handle the cemented area.

43. BUILDING.

If considerable amount of undertread is removed, it may be necessary to build up the undertread with padding stock. Any low spots must be built up with strips of padding stock, to slightly above the surface of the rest, figure 54. If cords are exposed, cover with cushion. After being built up, the tire should be the proper dimension of overall

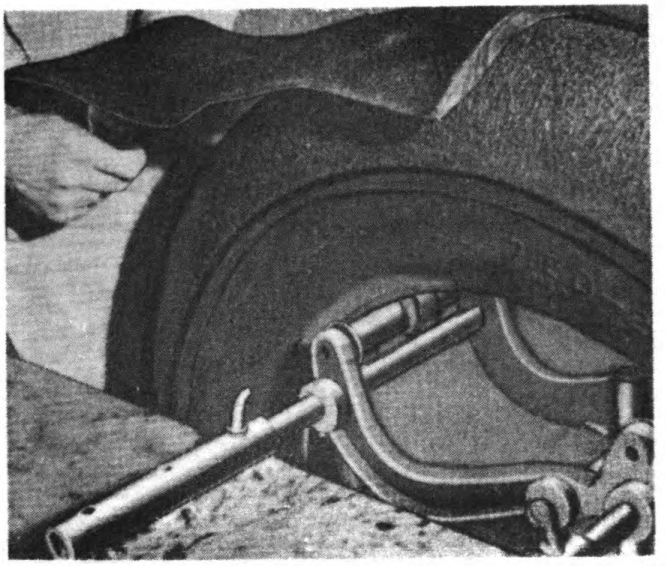


RA PD 39449

Figure 55 — Applying Padding Stock

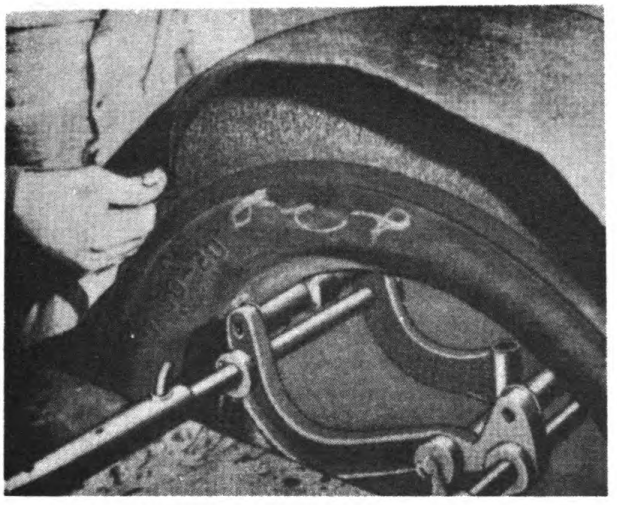
diameter and tread width. Consult table(s) in this section in order to determine correct camelback size and whether or not padding is necessary. Occasionally the correct width camelback will not be available. In such cases, a smaller size camelback may be used and then padded on the sides. Padding stock is cut square across the end and applied by stitching the end and rolling the remainder. Strip off the holland about six inches ahead of the rolled part by pulling smoothly and evenly, figure 55. Do not stretch the stock as that will thin the section.

Apply the camelback, paying particular attention to centering it on the tread. The end should be cut straight across and beveled at an angle of 45°. When beginning the camelback, strip off six to eight inches of holland and center the end on the tread, figure 56; then press the camelback down. (Handle the protected face of the stock as little as possible. Edges, and cut or touched areas should be freshened by wiping with solvent.) Lay the camelback on smoothly and evenly in the center of the tire, removing the holland as you go along. Moisten the edges of the cemented area with rubber solvent. The wings of the camelback should be pressed down every 12 to 18 inches to check the centering of the stock on the tread, figure 57. The end of the camelback should be laid over the starting end as far as possible and the lap should be marked at both sides. Bevel the finishing end off ¼ of an inch longer than is needed, to match the starting end, figure 58. Wipe the cut ends with solvent and crowd the excess of the finished end against the splice. Roll down with a stitcher, figure 59. If through an error there is a gap in the



RA PD 39450

Figure 56 — Centering End of Camelback on Tread



RA PD 39451

Figure 57 — Checking Position

splice, the gap must be filled in with tread stock. Moisten the edges of the camelback and roll them down with a roller.

After the camelback has been entirely applied, the tire should be placed on the power roller, figure 60. Roll down the center and then progressively roll down the camelback from center out to and over each shoulder by operating the center roller.

Adjust the pressure of the rollers by tightening the crank firmly. Do not use excessive pressure.

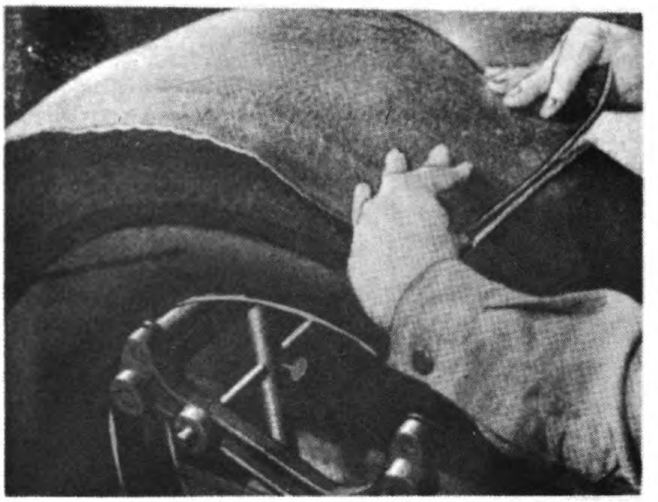


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Figure 58 — Beveled Finishing End

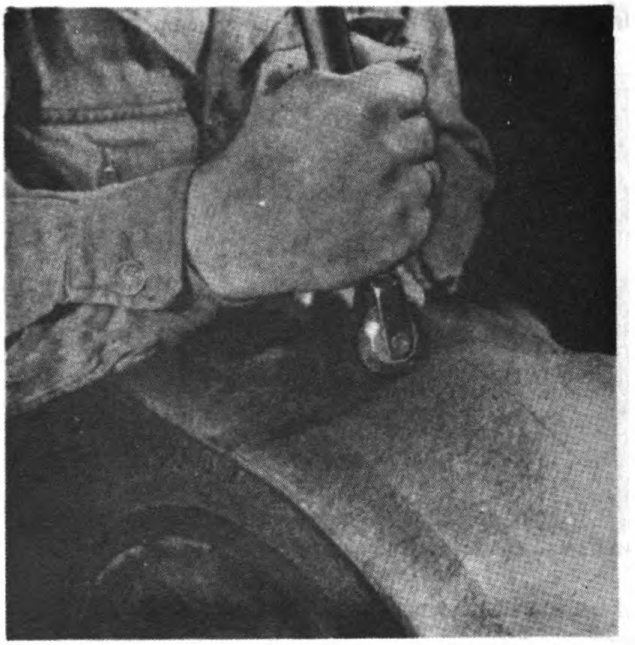

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Figure 59 — Stitching End

44. CURING.

a. For removing and installing the curing tube, it is necessary always to use a spreader. After the tire is spread open remove the valve core and buckle the tube by standing it upright and pressing straight down. Do not make a bend at the valve. Hold the tube in the buckled position and insert one of the doubled ends in the tire.

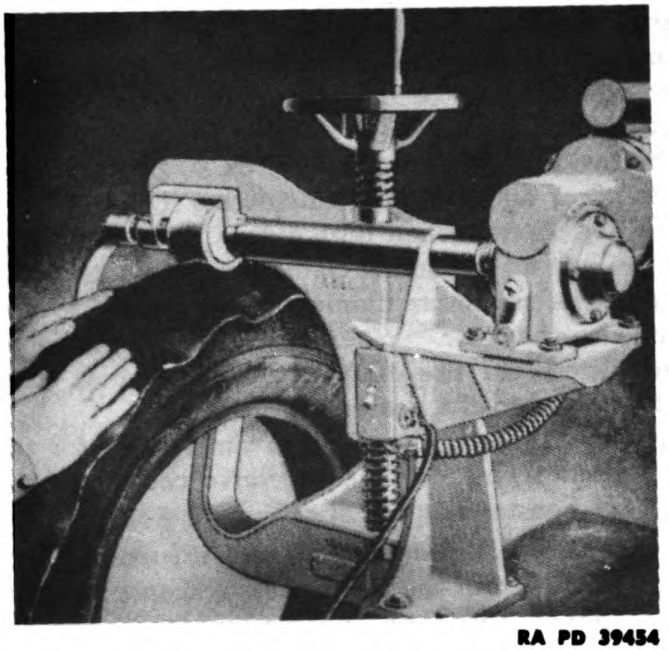

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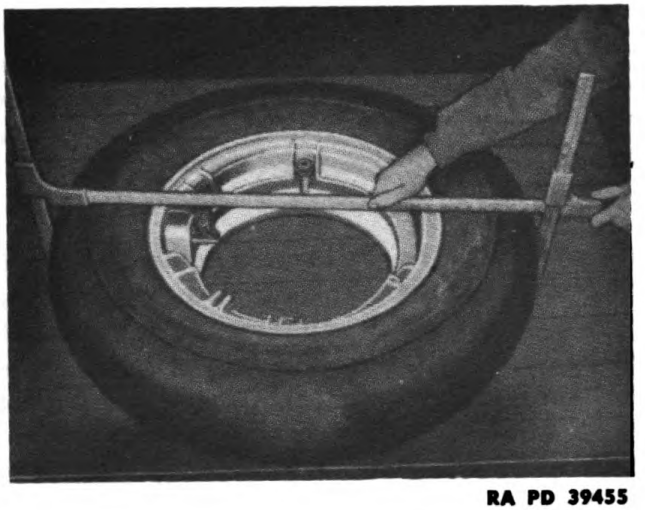
Figure 60 — Tire on Power Roller



RA PD 39455

Figure 61 — Measuring Tire

Then feed the curved part of the tube into the tire, and push out the buckle.

In order to remove all buckles and wrinkles from the tube, release the spreader and then slightly inflate the curing tube. When this is done, the beads of the tire should assume their normal position, and there must not be any buckles or wrinkles left in the tube.

b. In order to fit the tire into the mold so that the pressure is enough to cure properly but not so tight that the tire will buckle, it is necessary that the tire be measured and the rim and matrix adjusted accordingly. Measuring is done as follows:

Mount the tire and inflate to from 5 to 10 pounds pressure. Lay the tire on the floor and place the rule across it, figure 61. The longest horizontal leg should touch both sides of the sidewall. Push the short leg of the rule up to contact the tread. Move the rule from side to side to locate the maximum diameter of the tire. Be sure the short leg down touches the floor. When this is done, the reading on the longest rule will tell the tire *diameter,* and the short rule the *cross-section width.* Read to the nearest ⅛ inch.

Consult the table for the matrix and rim setting for the readings. Set the rim accordingly. Remove the valve core since the tube will be connected to a constant supply of air.

c. Place the tire in the mold, and lock it. Allow 5 minutes for trapped air to escape from the tread design; then connect the tube to the air line. Allow curing time in accordance with the curing chart, paragraph 49 below. Remember, when calculating the curing time, that the *thickness* is the total of the camelback plus padding stock at the thickest point. A slight over-cure is acceptable but under-cure is not.

d. After curing, disconnect the air line, allowing the tube to deflate, and remove the tire. Open the tire on a spreader to remove the tube; then paint the curing tube. To remove the curing tube it may be necessary to use a bar to buckle the tube.

45. FINAL INSPECTION.

Immediately after cure, the tire must be reinspected. The inspector will note and mark particularly any softness of tread lugs, indicating an under cure or a spongy tread; any buckling as indicated by a bulge around the inside; any separation as indicated by bulges in the tread and by a hollow sound when tapped; and any off center or non-symmetrical treads. Any of these conditions render the tire unsuitable for military service.

Section IV

TUBE REPAIRING

46. INSPECTION.

a. Locate the leak by submerging either the entire inflated tube or part of the tube in water (locate leaks in extremely large tubes by running water over surface and watching closely). Check the valve core, especially for slow leaks. If the leak is thought to be around the valve stem but does not show up under water, work the stem around to break any possible temporary or low-pressure seal.

b. The more common causes for leaks are as follows:

(1) Punctures or cuts through tube.

(2) Valve base not sealing (caused by loose hex-nut or split fabric in valve base).

(3) Holes chafed through the tube by a tire break or rough bead toe.

47. SIZES OF INJURIES.

The terms "large" and "small" injuries are defined roughly as follows:

Passenger, or other small thin tubes:	Small — under 1 inch Large — over 1 inch
Truck or other large, thick tubes:	Small — under 2 inches Large — over 2 inches

48. REPAIR METHODS FOR INJURIES.

There are three general methods for repairing tube injuries.

a. Cold patch (for emergency use only).

(1) Buff tube at least 1-in. beyond injury in all directions.

(2) Wash buffed area with dry-cleaning solvent.

(3) Apply cold patching cement thinly and evenly to the cleaned area and allow it to dry.

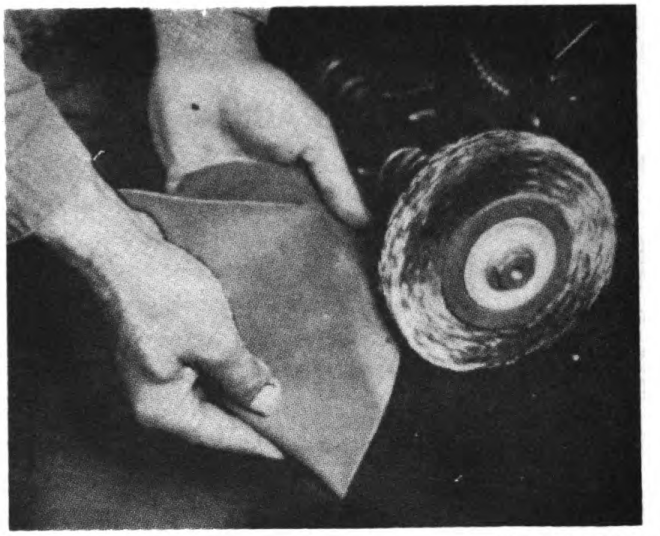


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Figure 62 — Buffing Injury

(4) From cold patch repair material, cut a piece that is slightly smaller than the buffed area, cutting with a bevel from the holland side.

(5) Remove holland from patch. (Be careful not to touch adhesive face with fingers).

(6) Center patch over injury and roll down hard.

b. Reinforced, cured patch (for "large" injuries, as defined).

(1) Open the hole or injury by trimming edges. Round the ends and buff the edges thoroughly, figure 62. (Stretch tube if necessary to aid in buffing.)

(2) Wash the inside of the tube for an inch or more around injury with a clean piece of flannel dipped in solvent.

(3) Cement the buffed and cleaned area both inside and out with vulcanizing cement.

(4) Cut a piece of cold-patch gum large enough to extend ½ inch beyond injury in all directions.

(5) Using long-nosed pliers, dip the patch in solvent and insert it through the injury with the raw gum facing the underside of the injury. If preferred, instead of using pliers, the patch may be placed over the hole and held in position against the opposite side of the tube, while the injured side is lifted up over the patch, figure 63. Then the injured side should be pressed down on the patch. When the solvent has evaporated, press the patch into place.

(6) Fill the injury with cushion gum, figure 64. Roll it down and trim the edges flush with the surface of the tube. Leave the center slightly higher to insure proper curing pressure. (Too much gum, or excess pressure during cure, will cause the repair to bulge.)

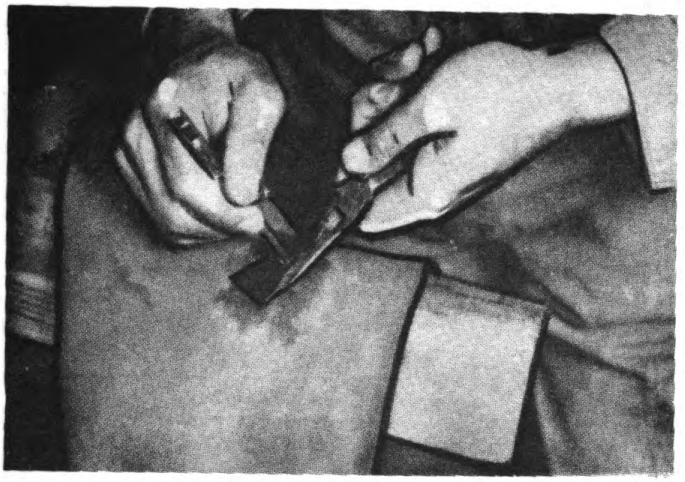

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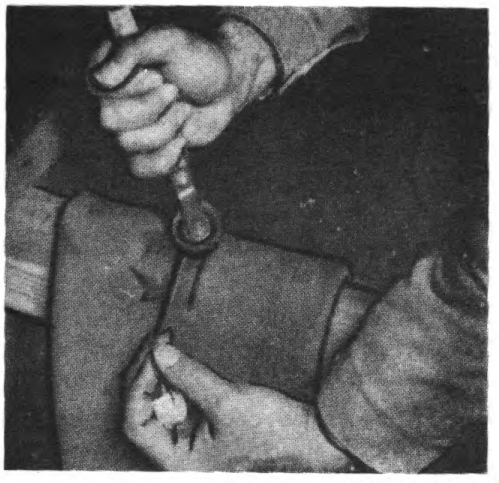
Figure 63 — Placing Reinforcement



RA PD 39458

Figure 64 — Filling Injury with Cushion Gum

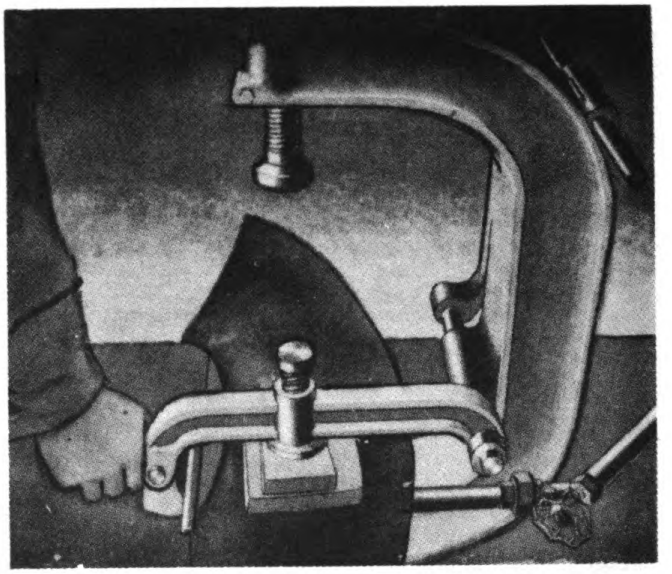
(7) To obtain a smooth surface on the repair, place a piece of holland between the tube and hot plate during cure. Do not use holland for repairs over 4 inches.

(8) Place in spotter, figure 65, and cure in accordance with paragraph 49 below.

c. Cured patch (for "small" injuries, as defined). Same as for reinforced, cured patch except that the preparation and application of cold patch repair material on the inside is omitted.

d. Synthetic tubes. Reinforced cured patch. (All sizes.)

Note: All of the following operations must be carefully followed when servicing synthetic tubes.



RA PD 39459

Figure 65 — Spotter

(1) Open the hole or injury sufficiently to apply inside patch by trimming edges.

(2) The opening or injury after trimming to be not less than ¼ in. wide.

(3) Round the ends of all elongated injuries after trimming.

(4) Buff the inside and outside of tube an inch and one half (1½-in.) in all directions from injury. Buff the trimmed edge thoroughly. (Do not stretch tube more than necessary when buffing edge.)

(5) *All buffing to be done cross sectionally* and not circumferentially in order to eliminate making grooves in direction of long dimension of injury.

(6) Cement the buffed area both inside and outside, also edge of injury with vulcanizing cement.

(7) Cut a piece of cold patch gum (cured back or combination) large enough to extend 1 inch beyond injury in all directions.

(8) Remove the backing from the combination gum. Using long-nosed pliers pick up the piece of combination gum in the center of the uncured side. Dip in solvent and insert through the injury, uncured side up. If preferred, instead of using pliers, the patch may be placed over the center of injury and held in position against the opposite side of the tube, raise the top or injured side of tube which will place the combination gum in position under the injury. Allow sufficient time for solvent to dry, then press the under side of the buffed and cemented area down on combination gum.

(9) Fill the injury with *black tread gum* flush with surface of tube.

(10) Cut a piece of black tread gum, $\frac{1}{16}$-in. gage, large enough to extend $\frac{3}{4}$-in. beyond injury in all directions.

(11) Apply black tread gum to buffed and cemented area, centered over filled injury and stitch down well.

(12) Cure on hot plate.

(13) Cure (4-a). (Truck and other heavy tubes.) 7 minutes for each $\frac{1}{32}$-in. thickness (including the filled injury as part of total thickness) at 287° (40 lb).

(14) Do not apply too much pressure with tube plate clamp. Do not crease or fold synthetic tubes under pressure block on tube plate. Pressure block must be small enough so it does not press the fold or edge of tube either on rim or tread side during cure.

(15) Do not handle or inflate synthetic tubes after removing from tube plate until thoroughly cold.

49. CURING TIME.

Hot plate curing (with the repair next to hot plate).

Passenger car tubes (Cured Patch, paragraph 48 **c**)	*Cured patch repair* 10 min. at 307°F. (60 lb) or 15 min. at 287°F. (40 lb)
Passenger car tubes (paragraph 48 **b**)	*Reinforced cured patch* 15 min. at 307°F. (60 lb) or 25 min. at 287°F. (40 lb)
Truck and other heavy tubes (paragraph 48, **b** or **c**)	*For each $\frac{1}{32}$-in. thickness* Cure: 5 min. at 307°F. (60 lb) or 7 min. at 287°F. (40 lb)

Valve pad cures for use in curing on replacement valve pads:

Passenger or other thin tubes	10 min. at 307°F. (60 lb) or 15 min. at 287°F. (40 lb)
Truck or other thick tubes	15 min. at 307°F. (60 lb) or 25 min. at 287°F. (40 lb)

50. VALVE REPLACEMENTS.

Inspect the valve. Following are the common valve defects needing repairing:

a. Metal valves.

(1) Bent, distorted, or broken stem.

(2) Smashed or damaged threads on stem.

(3) Damaged valve pad which will not permit a perfect seal. This pad may be damaged in service or by a careless operator when he removes the old valve base.

b. Metal valves with cured rubber base. Same as for metal valves, except for the valve pad defects (3).

c. Rubber valve stems. Stems broken or torn off.

NOTE: Always inspect the old valve stem hole before using it for a replacement valve.

51. TYPE OF REPAIR TO USE.

Replace damaged valve stems according to one of the following methods:

a. Replacing rubber valves.

(1) Cut off the stem of the damaged rubber valve as close to the base as possible.

(2) Buff over the surface of the original valve base by holding it lightly, with the finger tips, against a wire buffing brush.

(3) Using a sharp pointed knife, cut a small hole ¼-in. to ⅜-in. in diameter through the center of the original rubber valve base.

(4) Wash the buffed surface with rubber solvent and apply one heavy coat of vulcanizing cement. When cement has dried, remove the holland covering from the new valve; then center the hole in the new valve over the hole cut in the tube. Press valve firmly onto the tube. Stitch the new valve base down tightly.

(5) Complete this operation by using equipment especially designed for curing rubber valves onto tubes. Cure: 10 min. at 307°F. (60 lb), or 15 min. at 287°F. (40 lb).

b. Changing metal valves in tubes.

(1) Clamp in valves (valve pad on the tube, and seal made by lock nut pressure).

(a) Remove the lock nut and bridge plate. Push the valve to be removed *back into the tube.*

(b) Cut a small round hole in the sidewall of the tube ⅛-in. to ¼-in. in diameter and remove the old valve. Insert the new valve through this hole by stretching the tube sufficiently to make the change.

(c) After the valve has been changed in the tube, the hole cut in the sidewall of the tube should be repaired as previously outlined for small injury. The new valve is then placed in position and the bridge plate and lock nut assembled and tightened properly.

(2) All-metal cured-in valves (metal base is cured into a rubber valve base and is an integral unit).

(a) If the lower part of the valve is not damaged or there is no base leak, repair by cutting off to form a spud and screw a replacement valve on the spud.

(3) Spud mounted valves. Unscrew the valve and apply a new one.

TIRE REPAIR AND RETREAD

52. REPAIRS TO SECTIONAL CURING BAGS.

a. Buff one inch larger than the injury all around to form a cup ⅛-inch to ¼-inch deep at the injury tapering to nothing at the edges.

b. Apply one heavy coat of cement and dry.

c. Cut a piece of tread stock ½ inch larger than the original injury and stitch into place. Fill the hole with tread stock, using a stitcher to pack firmly.

d. Puncture any air bubbles.

e. Cut a two-ply patch, or build up from cord fabric, the size of the cemented area and stitch down. Puncture any air bubbles.

f. With tread gum, cover the patch and the area ½ inch all around the patch, building out as necessary to full size and shape. Roll the patch into place and release any air.

g. Dust the repair with soapstone and insert in a clean tire.

h. Leave the tire in the mold heated at 50 pounds of steam.

i. For the first five minutes, there should be no air pressure in bag. Add ten pounds of air every 5 minutes until the pressure is 80 pounds. Cure for 2 hours.

53. REPAIRS TO CURING TUBE.

These can be accomplished by the method specified for truck tubes. They should be cured according to the thickness. Before starting a repair, remove as much glycerine as possible and clean the injured area.

54. STEAM AIR METHOD FOR REPAIR CURING.

The general method of repairing described under Section "Standard Tire Repair" applies to repairing for the steam air method of curing in a chamber with the following exceptions:

a. Mark the area to be buffed inside the tire around a flexible template ½-inch larger than the patch to be used.

b. Roughen the tread plug with a burr rasp and avoid deep grooves as may be obtained with wire brush.

c. Determine the number of plies and size of patch in the regular manner. An uncured pre-built patch should be used whenever 6 or more plies are required. Repairs with 12 or more plies should be made with two uncured pre-built patches of from 6 to 10 plies in each.

Cured patches in small 2 and 4 ply sizes can be used if preferred.

The uncured pre-built patches may be purchased as a fully cushioned unit or they may be made up from cord fabric as described under paragraph 33a (2) and finished as follows: Remove all trapped air from between each ply. Fold a $\frac{1}{32}$-in. thickness gum strip over the ends of the two largest plies and cover the small ply side of the

patch with a layer of $\frac{1}{32}$-in. cushion gum large enough to cover the entire buffed area inside the tire.

d. Fill the inside skive with cushion gum level with the inside ply and stitch thoroughly to remove all air with a ¼-in. x 2-in. smooth stitcher. Trim level with the inside ply with a special offset knife. Cover the inside skive with a cushion oval to provide a 1 inch margin.

Remove covering from patch and fold it so that the patch may be placed inside the tire with the ply of the patch next to the tire parallel to the inside ply cords and accurately center it over the injury.

Stitch the center tightly to remove bridging. Allow the beads of the tire to come as close to their normal position as possible before stitching the remainder of the patch.

Pull the wings of the patch while stitching each to the tire with a ¼-in. smooth roller to insure straight cords and no patch bridging.

Cushion all exposed buffed fabric on inside of tire around patch. The inside work should be done as neatly as possible because the appearance of the repair will be the same after cure.

e. Build up the outside the same as described under 33b except use soft tacky stock. Do not stretch the stock in application, roll out all trapped air and seal the union to original tread with a layer of tread stock.

f. Curing: Follow the manufacturers' recommendations as to the care and maintenance of equipment, especially as to oiling, painting the sealing gasket and following:

(1) Preheat the chamber to at least 270°.

(2) Exhaust the chamber and open it.

(3) Place the tire in the chamber so that the condensate will drain away from the repair.

(4) Close the chamber and lock securely.

(5) Close all outlets and open main air line until pressure rises to 45 - 50 pounds.

(6) Close air line.

(7) Open steam line and trap line. (Be careful not to open the steam line so far that the pressure on boiler drops below 90 pounds.)

(8) As soon as chamber temperature rises to curing temperature, shut main steam line, open Fulscope valve line, and open air line to bring pressure to 85 pounds. Set air valve to maintain 85 pounds. Start counting time for first stage after the temperature reaches 260°F.

(9) Turn off steam at end of first stage and leave air on.

(10) At the end of second stage, shut air off, close trap line, and open exhaust *just enough to release the pressure not faster than 3 pounds per minute at the start.*

The total time required to release the pressure must be at least 45 minutes. This can be accomplished by opening the ¾-in. exhaust valve one-half turn.

The cures are based upon maximum total tire and patch thickness which should be determined before building in the repair.

g. Cure Chart.

Maximum Tire & Repair Thickness in Inches	First Stage Time 270° F. and 85 Pounds Pressure	Second Stage Time 85 Pounds Air, Steam Shut off	Third Stage Time Pressure Being Released
½-in.	50 Min.	10 Min.	45 Min.
1-in.	65 "	20 "	45 "
1½-in.	75 "	30 "	45 "
2-in.	85 "	40 "	45 "
2½-in.	100 "	50 "	45 "
3-in.	120 "	70 "	45 "

More than 3 inches

Maximum Tire & Repair Thickness in Inches	First Stage Time 260° F. and 85 Pounds Pressure	Second Stage Time 85 Pounds Air, Steam Shut off	Third Stage Time Pressure Being Released
3½-in.	160 Min.	80 Min.	45 Min.
4-in.	190 "	80 "	45 "
4½-in.	220 "	90 "	45 "
5-in.	240 "	110 "	45 "
5½-in.	260 "	110 "	45 "

Where spots and reinforcements are the deepest repairs in the tire, double the depth of the deepest spot and use this figure to select the cure from above chart.

Section V

SYNTHETIC TIRES

55. RETREADING SYNTHETIC TIRES.

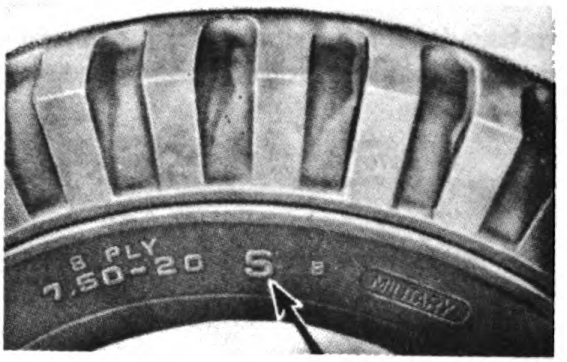
a. Prepare tire in normal manner.

b. Use regular vulcanizing cement.

c. Synthetic camelback (Buna-S) has regular cushion backing applied.

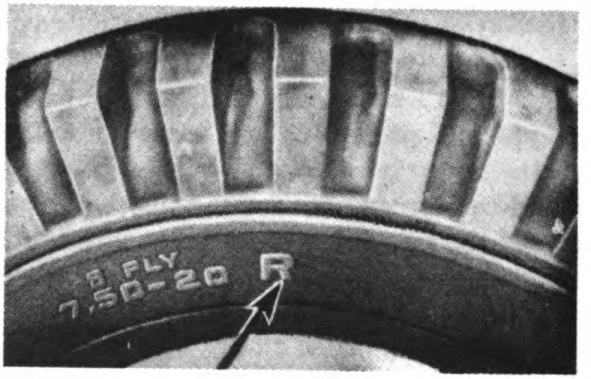
d. Apply camelback in usual manner, except it is *extremely* important that camelback is *not* stretched. Cut 2 inches longer than needed and work surplus in on each side of splice.

e. Cut splice on perfect 45 degree angle. Buff both ends of splice and cement both ends. Let cement dry properly and join splice.



RA PD 39460

Figure 66 — Synthetic Tires are Identified by Letter "S" or ¾" Red Dot on Sidewalls



RA PD 39461

Figure 67 — Rayon Tires are Identified by Letter "R" or "Rayon"

f. Increase curing time 20% over regular camelback curing time, depending upon equipment being used.

56. REPAIRING SYNTHETIC TIRES.

a. Prepare tire in regular manner.

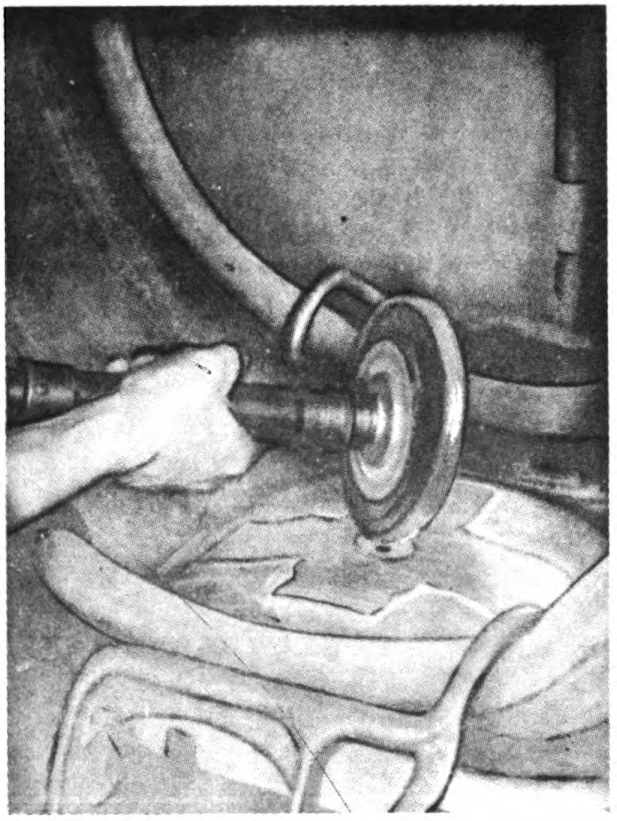
b. Use regular repair materials.

c. Follow regular curing schedules.

d. When removing tire from mold, do not distort or strain tire in region of repair until thoroughly cold.

e. When removing air bag in spreader, slide bag around to another section of tire that has not been repaired. Union between synthetic and regular repair material is not too strong when hot.

f. When buffing area of repair, use rasp lightly so that a rough surface results without polishing or burning.



RA PD 39462

Figure 68 — Buff Rayon Cords Lightly

NOTE: Repair materials (cushion and tread stock must *not* be stretched.

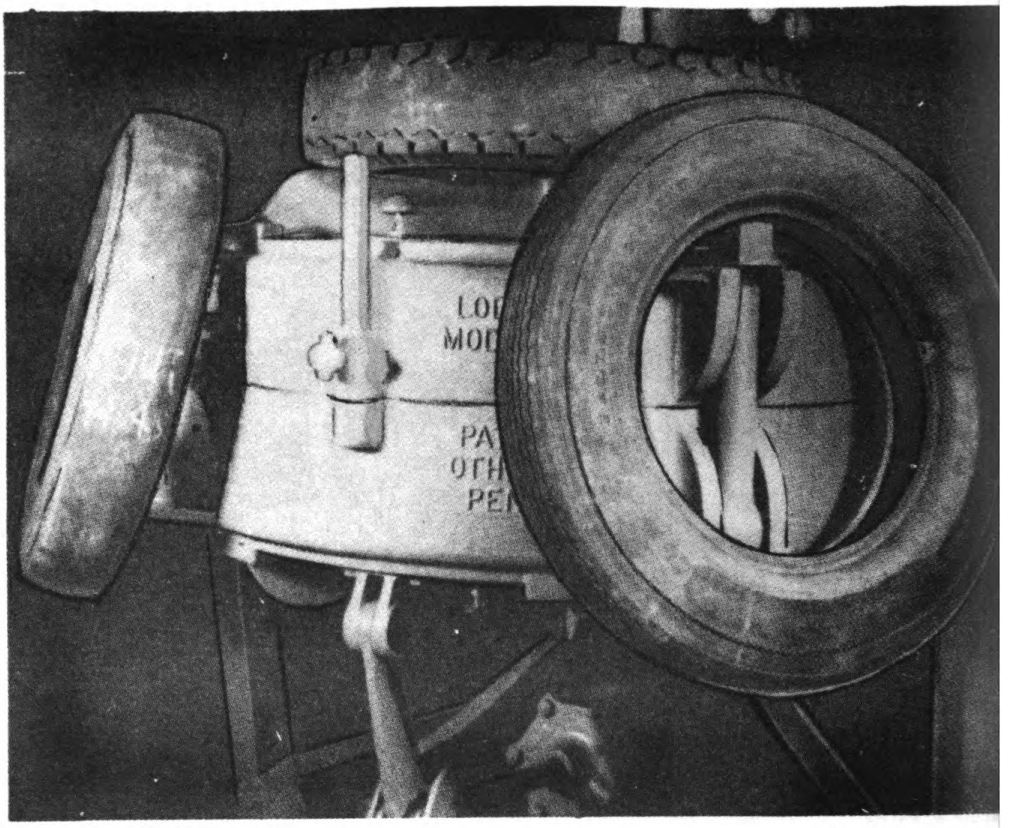
57. SECTION REPAIRS ON RAYON CASINGS.

Due to the fact that rayon cord fabric is different from cotton fabric, the methods and materials are slightly different. Rayon cord, having no natural affinity for rubber, is coated with a special material, in order that it may adhere to rubber. Rayon tires should always be repaired with rayon material. By using the same type of fabric, the repaired section will retain the physical characteristics of the rest of the tire. Rayon cord repair fabric has been developed especially to supply this need. The following method, based on the use of this material, should result in satisfactory section repairs.

58. METHOD OF REPAIRING RAYON CASINGS.

Rayon casings are repaired same as conventional ones, with the following exceptions:

a. Buff cords lightly (fig. 68) so as not to remove any more of the original covering than necessary to secure a clean surface. Extreme



RA PD 39463

Figure 69 — Tires Can Be Quickly Dried on Molds in Service

care should be exercised so as not to tear or rip any cords.

b. Immediately after buffing, apply one coat of special rayon cement, allowing to dry at least 30 minutes, at which time apply a second coat of regular cement.

c. In case ready-built patch of proper size is not available, and raw materials are to be used, build the patch on a table, cushioning the side that goes next to the band ply if it is desirable to build a patch in the tire ply-by-ply, then after cavity has been filled with cushion, the entire buffed and cemented area should be covered with one layer of $\frac{1}{32}$ in. gage cushion.

d. Whenever possible, rayon tires should be heated slightly above room temperature (approximately 90 degrees) before buffing.

e. In the outside skive where cords are exposed, apply one coat of special rayon cement first, as described above.

f. It is of *utmost importance* that the damaged portion of any rayon tire be thoroughly dried before repair is made. A practical and convenient method of drying tires, is to place them on a mold in service, fig. 69.

TIRE REPAIR AND RETREAD

APPENDIX "A"

REPAIR CURING SCHEDULES

These conditions apply to following schedules:

1. Curing time starts when bag is inflated in sectional mold and ends when air is released.

2. These cures are based on the use of soapstone paste for design filler (*no rubber matrix*).

3. These cures are based on the use of hot bags (i.e., ones that have just been pulled from a previous cure).
   IF A COLD BAG IS USED, ADD 15 MIN. TO THE FIRST STAGE OF CURE.

4. The mold cures are for slightly worn tires.
   FOR WELL WORN TIRE, DEDUCT 10 MIN. FROM FIRST STAGE.

SECTIONAL MOLD CURES

I. For Sectional Repairs in Tread or Shoulder Areas

First Stage	Second Stage
Steam on Mold @ 281°F.	Same as 1st stage (Mold on)
Steam in Bag @ 60 lb (307°F.)	Air in Bag (80 lb)

CONVENTIONAL—MUD AND SNOW			COMBAT		
Size	1st Stage	2nd Stage	Size	1st Stage	2nd Stage
5.50	50	—	6.00X16	85	—
6.00	60	—	6.00X20	90	—
6.25	60	—	7.50X20	120	30
6.50X16	65	—	7.50X16	130	—
7.00X15-16	70	—	8.25X16	120	30
7.50X15-16	75	—	8.25X20	120	60
6.00X20	75	—	9.00X16	120	60
6.50X20	75	—	9.20X20	120	60
7.00X20	70	60	10.00X22	130	60
7.50X20	70	60	11.00X20	140	80
8.25X20	70	70	12.00X20	150	90
9.00X16	70	70	14.00X20	170	110
9.00X20	80	60	14.00X24	170	110
10.00X20-22	90	80			
11.00X20	90	90			
12.00X20	100	100			
13.00X24	110	110			
14.00X20-24	120	120			
30X5	75	—			
32X6	70	60			

II. For Sectional Repairs in Sidewall Areas Only.

(For Sidewall Repairs extending into tread or shoulder regions, use schedule "For Sectional Repairs in Tread or Shoulder Areas".)

A. For all Passenger Tires

Mold - 280°F.

Steam in Bag @ 307° F. (60 lb)

All 4-ply tires . . . . . 40 min.

All 6-ply tires . . . . . 60 min.

B. Truck and Combat Sizes

CONVENTIONAL OR MUD AND SNOW			COMBAT		
Size	1st Stage	2nd Stage	Size	1st Stage	2nd Stage
7.00X20	50	30	6.00X16	60	—
7.50X20	50	30	6.00X20	70	—
8.25X20	50	30	7.50X16	80	30
9.00X16	50	30	7.50X20	90	30
9.00X20	50	40	8.25X16	90	30
10.00X20-22	60	40	8.25X20	90	40
11.00X20	60	40	9.00X16	90	40
12.00X20	60	50	9.00X20	90	40
13.00X24	70	50	10.00X22	90	50
14.00X20-24	80	50	11.00X20	100	50
30X5	70	0	12.00X20	100	60
32X6	50	30	14.00X20-24	110	70

CAUTION:

1. When steam is used in bag, open valve of outlet hose slightly to allow a slight discharge of vapor (for proper steam circulation).

2. Temperatures should be determined by thermometers on molds. The curing temperature specified means in the mold. (Gages are not permanently dependable.)

III. For Curing Spot Repairs

Sectional molds—Temperature at 281° F.

A. Sidewall spot cures — without inside reinforcements

1. All passenger tires — 40 min.—air in bag
2. All truck tires — 60 min.—air in bag

B. Tread Spot Cures — without inside reinforcements

1. Passenger tires — air in bag

⅛ inch deep — 35 min.

¼ inch deep — 45 min.

½ inch deep — 60 min.

2. Truck tires

(a) Up to size 12.00

⅛ inch deep — 60 min. — air in bag

¼ inch deep — 80 min. — air in bag

½ inch deep — 70 min. — 60 pounds steam in bag

¾ inch deep — 80 min. — 60 pounds steam in bag

1 inch deep — 90 min. — 60 pounds steam in bag

(b) Sizes 12.00 - 13.00 and 14.00

½ to ¾ inch deep — use first stage of sectional repair schedule for tread area.

¾ to 1 inch deep — use sectional repair cure schedule for tread area with 30 min. deducted from second stage.

3. Combat tires

For cuts up to ½ inch — use truck tire spot cure schedule

For cuts ½ to 1 inch — use following schedule:

6.00 - 16 and 20 — 70 min. — 60 pounds steam in bag

7.50 - 16 and 20 — 90 min. — 60 pounds steam in bag

8.25 through 14.00 — use same schedules as for full sectional repair in sidewall.

SPOT PRESS CURES

Press temperature — 307° F. (60 lb steam)

I. Passenger tires

1/16 inch deep — 25 min.

⅛ inch deep — 40 min.

¼ inch deep — 55 min.

II. Truck tires

1/16 inch deep — 30 min.

⅛ inch deep — 45 min.

¼ inch deep — 60 min.

IV. For Retreads or Recaps

		CAMELBACK DIE SIZE		*Cure at 293° F. (45 lb)	
Matrix	**Size**	**Full Recap**	**Retread**	**Full Recap**	**Retread**
F-2-111-N.D.	6.00X16	52-76-14	50-74-16	80 Min.	90 Min.
F-224-N.D.	7.00X20	70-100-16	66-96-20	90	110
F-221-N.D.	7.50X16	70-100-16	66-96-20	90	110
F-2A-225-N.D.	7.50X20	70-100-16	66-96-20	90	110
F-2A-226-N.D.	8.25X20	70-100-16	66-96-20	90	110
F-2A-224-1-N.D.	9.00X16	80-114-18	76-112-22	100	120
F-2A-332-N.D.	9.00X20	80-114-18	76-112-22	100	120

*Note 1. *Cures* — Add 10 min. additional time for each ply of 1/16 in. padding stock used.

*Note 2. *Cures* — All filled injuries ⅜ in. and over in depth must be pre-cured in a sectional mold. No additional time is necessary on treading one for fill-ins under ⅜ in. in depth.

*Note 3. *Air pressures* — 160 pounds.

TECHNICAL MANUAL

ORDNANCE MAINTENANCE

TIRE REPAIR AND RETREAD

CHANGES No. 1

WAR DEPARTMENT,
WASHINGTON 25, D. C., 13 November 1943.

TM 9–1868, 27 May 1943, is changed as follows:

55. RETREADING SYNTHETIC TIRES.

* * * * * * *

d. Apply camelback in usual manner, but be *extremely* careful *not* to stretch it. This is very important. Cut ¼ to ½ inch longer than needed and work surplus in on each side of splice.

e. Cut splice on * * * cement both ends. Let cement dry properly, apply small strip of natural rubber cushion gum to the ends, and join splice.

f. Use a liberal quantity of mold lubricant and cure in the regular manner. Curing time should be the same as regular camelback curing time, depending upon equipment being used.

[A. G. 300.7 (3 Aug 43).] (C 1, 13 Nov 43.)

56. (Superseded.) REPAIRING GR-S SYNTHETIC TIRES.

a. Skive out injury in such a manner that all of the damaged cords and tread are removed. Round out all corners and skive slightly flatter than 45°. On 6-ply tires and under, bevel from one side only, inside or outside, depending on which will result in the smaller opening. On 8-ply tires and above, bevel from both sides, if injury is through the tire, making the bevels meet at the top or last ply of the tire.

b. Rasp the beveled tread surface thoroughly. It is extremely important that a well-roughened surface be obtained.

c. Buff the inside of the tire in the regular manner with brush rotating parallel to cords leaving cord coat intact if possible.

d. Cement all surfaces to which new rubber is to be applied with two coats of vulcanizing cement. Stipple cement in.

e. Line all skives completely with truck cushion gum.

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*The individual items in this change will be cut apart and pasted over the specific paragraphs or subparagraphs affected.

f. Fill in the carcass skives with truck cushion gum—minimum $\frac{1}{32}$ gage.

g. Apply inside repair. Use repair unit construction according to TAC ES 705A, either cured, semicured, or uncured.

h. Fill in the thread skive with tread repair gum and trim slightly higher than tread surface.

j. Cure according to recommendations. It is important that these time and temperature schedules be followed to get the maximum strength in the repair with the least effect on the original tire. Speed-up practices such as boosting mold temperatures and reducing time, or removing tires from molds when convenient, should be avoided. CURE ACCORDING TO SCHEDULES and maintain equipment so that it will attain the recommended temperature.

Precautions: Curing bag should be loosened with a minimum amount of tire spreading, then remove from a cold section of the tire.

Curing plug must be cold before finishing (buffing or grooving).

[A.G. 300.7 (3 Aug 43).] (C1, 13 Nov 43.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.